RCHT PATHOLOGY USER GUIDE

V 10.0

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1. Introduction

1.1. The analysis of Pathology specimens provides important information concerning the diagnosis and treatment of diseases. This user guide is intended to provide general information in support of this aim.

1.2. The Pathology mission statement:

"To continue to provide and develop quality, cost-effective Pathology services and staffing relevant to local clinical practice and within a changing technological, functional and organisational environment"

1.3. This guide is designed to help you make the best use of Pathology services.

1.4. There are two specialities within Pathology in Cornwall

- Laboratory Medicine comprising:
  Clinical Chemistry, Haematology, Blood Transfusion and Clinical Microbiology

- Diagnostic and Molecular Pathology comprising:
  Histopathology, Cytopathology, Molecular and Cellular Pathology, Mortuary and Bereavement services.

All departments are based at the Royal Cornwall Hospital in Truro, where there are consultants in all specialities who can be contacted for advice.

1.5. Information and assistance regarding Point Of Care Testing may be obtained from the POCT team in Clinical Chemistry or on the POCT area on the RCHT Pathology website.

1.6. Comments about, or experience of problems with the service should be addressed to the Lead BMS, Consultant Head of Department, or to the Specialty Directors.

1.7. This version supersedes any previous versions of this document

2. Purpose of this Guidance

2.1. This guidance is to provide service users with information of sample types, specimens, tests repertoire, reference ranges and more specific guidance related to the four Pathology disciplines.

3. Scope

3.1. This guidance is provided for all users of the services provided by Laboratory Medicine and Diagnostic & Molecular Pathology, RCHT.

4. Ownership and Responsibilities

4.1. Role of the Managers

Line managers are responsible for ensuring staff are aware of this User Guide.

5. General Standards and Practice

5.1. Clinical Advice and Interpretation

Clinical advice is available from medical and senior scientific staff throughout normal working hours using the departmental numbers listed below. Information on specimen collection and test selection is given in the Appendix 1. Further details of Specialty-specific services are described in Appendices 2 (Laboratory Medicine) and 3 (DDMP).

Out of hours clinical advice may be accessed via the RCHT switchboard and asking for the member of medical staff on-call for the relevant department.

5.2. Urgent requests

If results are required to assist with urgent clinical decision, the laboratory must be notified by telephone, even during normal working hours. Without such notification, the specimen will not be prioritised and will be processed routinely. Please mark the request form 'URGENT'. Chemistry and Haematology requests from Primary care will be regarded as "Urgent" if they are received in a white envelope or in purple INR specimen bag

5.3. Results

It is our aim to issue results in a timely manner. Currently all results are reported electronically with additional results being sent as hard copies for some locations/ service users. Winpath results are available via Maxims and Winpath Ward Enquiry. To gain access to this, please contact CITS on 1717.

Hours of service
Laboratory opening hours are given below.

Clinical Chemistry
Monday to Friday 0800 to 2000 hrs
Saturday 0900 to 1600 hrs*

Clinical Microbiology
Monday to Friday 0800 to 1715 hrs
Saturday 0830 to 1230 hrs*

Haematology and Blood Transfusion
Monday to Friday 0800 to 2000 hrs
Saturday 0900 to 1300 hrs*

Diagnostic and Molecular Pathology (DMP)
Monday to Friday 0830 – 1700hrs
(There are no provisions for out of hours services within DMP)
* The Saturday/Sunday/Bank Holiday service offered by all departments is intended for essential work.
Urgent samples for CMB should be delivered to the laboratory before 1100hrs

5.4. Out of Hours

Urgent work will be processed at any time. Outside normal opening times (see above) the Biomedical Scientist (BMS) on duty or the Consultant on call for each department may be contacted through the Royal Cornwall Hospital switchboard (01872 250000).

Key factors affecting the performance of tests or the interpretation of results
These are given in the information related to each Department/Specialty, where necessary, or by contacting the laboratory. These include pre-analytical (sample handling) and analytical (laboratory methodology) variation, and biological variation within the patient.

Time limits for requesting additional tests
This is dictated by the stability of the test concerned and specimen retention time. These are given in the information related to each Department/Specialty or by contacting the laboratory.

Haematology
Tick the urgent box on the form, samples will be processed as they are received in the lab.

5.5. Courier Service

Courier vans deliver samples to the laboratories daily, times depending on location. Paper reports (where provided) are sorted ready for the courier vans to take out the following working day (see also results section below).

Enquiries should be made to the Courier Manager in Estates, telephone (01872 25) 2985 or 3813

There is no courier service at weekends. A limited service (collection from local Hospitals) usually operates on Public Holidays.

5.6. Contacting Pathology

Specialty Director of Laboratory Medicine
Dr S Fleming (01872 25) 2541
Specialty Director of Directorate of Diagnostic & Molecular Pathology
Dr H Jones (01872 25) 2550
Lead BMS Laboratory Medicine
Malcolm Owen (01872 25) 2508
Lead BMS Diagnostic and Molecular Pathology
Peter Helliwell (01872 25) 2550

Clinical Chemistry

Results and Enquiries	(01872 25) 2540/48
Generic email address	clinchem.rcht@cornwall.nhs.uk
Duty Biochemist	(01872 25) 3047
Consultant - Dr S C Fleming	(01872 25) 2541
Consultant Biochemist - Dr A Patterson	(01872 25) 2546
Principal Biochemists	(01872 25) 2564/2566
Lead BMS - Alan Bromley	(01872 25) 2542
Point of care testing	(01872 25) 2556
Downs screening - Dr Angela Mallard	(01872 25) 2564
Joint Reception Manager - Jo Walsh	(01872 25) 2554
Urgent Requests	(01872 25) 2547

Point of Care testing

Generic email address	POCT.POCT@RCHT.cornwall.nhs.uk
Clinical Chemistry - Helen Hobba	(01872 25) 2556
Clinical Chemistry - Kate Tregunna	(01872 25) 2540
Coagulation - Phil Carson	(01872 25) 2502

Clinical Microbiology

All Enquiries	(01872 25) 4900
Generic email address	RCHT.CMBEnquiry@cornwall.nhs.uk
Consultant/Head of Dept - Dr R P Bendall	(01872 25) 4900
Consultant - Dr S Jog	(01872 25) 4900
Consultant - Dr P Chakrabarti	(01872 25) 4900
Consultant - Dr A Evans	(01872 25) 4900

On weekday afternoons the on call Medical Microbiologist acts as a Duty Microbiologist for Clinical queries.

Laboratory Administrator - Kathy Pollard	(01872 25) 4974
Lead BMS (Bacteriology) - Julian Rogers	(01872 25) 4946

Haematology

Results and Enquiries	(01872 25) 2548
Consultant - Dr M D Creagh	(01872 25) 2524
Consultant - Dr A R Kruger	(01872 25) 2506
Consultant - Dr R S Noble	(01872 25) 2765
Consultant - Dr J Blundell	(01872 25) 3048
Consultant - Dr E Parkins	(01872 25) 2765
Consultant - Dr B Pottinger	(01872 25) 3048
Consultant Transfusion Scientist & Lead BMS (Haematology & Blood Transfusion) - Mr S Bassey	(01872 25) 2508
Lead Transfusion Practitioner - Ms D Thomas	(01872 25) 3093

Clinical Scientist (Coagulation) - Mr P Carson (01872 25) 2502
Lead BMS Immunology - Mr N Oakes (01872 25) 3040

Directorate of Diagnostic & Molecular Pathology
Results and Enquiries (01872 25) 2550

Speciality Director / Consultant - Dr H Jones
Consultant - Dr R Hohle
Consultant (Lead Cytopathologist) - Dr H Jones
Consultant - Dr M Jenkins
Consultant - Dr I Hopkins
Consultant - Dr H-B Smethurst
Consultant - Dr R Marshall
Consultant - Dr R Jenkins
Consultant - Dr J Stolte
Lead BMS (DDMP) - Mr P Helliwell
BMS Consultant (Cervical Cytology Specialist) - Mrs C Wilson
Lead BMS (Histopathology) - Mrs V Rodd
Lead BMS (Cytology) - Mrs C Winn
Mortuary Manager - Mr K Hammett (01872 25) 2555

Pathology Information Technology
Pathology IM&T Manager - Gwyn Bennett (01872 25) 3839

Cornwall IT Services (CITS) (01872 25) 1717
CITS.Servicedesk@Cornwall.nhs.uk
Please contact CITS initially for all queries regarding the setup of new Clinician Requester codes, or for messaging/result reporting issues involving mapping issues or multiple missing results

5.7. Request forms and specimen labelling requirements

5.7.1. Please refer to the current version of the Pathology Specimen Acceptance Policy which can be accessed via the Documents Library on the Cornwall and IoS NHS intranet. The full policy includes details of specimen integrity and Health and Safety. This policy is strictly adhered to by all departments.

5.7.2. Please see separate table for Diagnostic & Molecular Pathology specific requirements

DDMP Specific Form & Specimen Labelling Requirements

FORM LABELLING REQUIREMENTS	Please see Section 2 of the Specimen Acceptance Policy
Mandatory (i.e. will be rejected if not given)	
Surname, Forename or coded identifier	All requests (correctly spelt for Transfusion)
Unique identifier e.g. NHS number	NHS / Hospital number **and** date of birth are **mandatory** for Transfusion, Histology and Diagnostic Cytology. Desirable for all other specimens. All requests (except unknown patients)
Hospital number or Date of birth (if NHS number not given)	**Mandatory** all Transfusion, Histology and Diagnostic Cytology **CMB** HIV testing all requests (except unknown patients) NHS / Hospital number **and** date of birth are **mandatory** for Transfusion.
Signature of the requester	Transfusion, Histology and Diagnostic Cytology **CMB** HIV testing
Sample type	**Mandatory** Microbiology, Histology and Diagnostic Cytology DesirableTransfusion, Chemistry **(desirable** for all other specimens)
Site and side (if appropriate)	Microbiology, **Histology and Diagnostic Cytology, Chemistry**
Test(s) required	All requests
Desirable	
Patient home address including post code	All requests
Patient location and Report destination	All requests
Consultant or GP (code)	All requests
Clinical details including relevant medication	All requests
Gender	All requests
Complete all boxes of HMR 101/5b	Cervical cytology
Tests required	All requests
Age (if DoB not given) (approximate age for unknown patients)	All requests
Practioner's contact no. (bleep or extension)	All requests

SPECIMEN LABELLING REQUIREMENTS	Please see section 4 of the Specimen Acceptance Policy
Mandatory (i.e. will be rejected if not given)	
Surname, Forename or coded identifier	All specimens
NHS / Hospital number or Date of birth	NHS / Hospital number **and** Date of birth are **mandatory** for Transfusion Histology and Diagnostic Cytology Desirable for all other specimens
Signature of person taking the specimen	Transfusion only
Sample type	Clinical Microbiology, Histology and Diagnostic Cytology
Site and side (if appropriate)	Clinical Microbiology, Histology and Diagnostic Cytology
Date and time of collection	Mandatory for Transfusion, Histology and Diagnostic Cytology desirable for all specimens
Desirable	
Report destination	All specimens – failure to provide this information will lead to delays
Hospital number	All specimens
Gender	Transfusion

5.7.3. Poor or illegible handwriting may be misinterpreted and result in report delay. Please help to minimise this by completing all sections of the appropriate request form using a ballpoint pen. Printed patient addressograph labels are preferable to minimise error **(except in Blood Transfusion where they are not acceptable)**

5.7.4. It is essential that a summary of relevant clinical details and therapy is included for the correct processing of the specimen and interpretation of results

5.7.5. Request forms (with sealable bags)

Haematology/Clinical Chemistry (WCH/GP/Community)	CHA1844
Clinical Microbiology	CHA26
Haematology (RCH requests only)	CHA101
Chemistry (RCH requests only)	CHA171
Blood Transfusion	CHA414
Diagnostic & Molecular Pathology (Yellow Headed)	CHA1140
Diagnostic & Molecular Pathology 2 week wait Cancer Referral (Orange Headed form)	CHA2590

5.7.6. Cervical Cytology (NHSCSP)

HMR 101 / 5 forms are available from Cytopathology department or printable versions are available from the Open Exeter system – If printing, choose the A5 format. If using A4 paper, select portrait printing format prior to printing.

5.7.7. Routine Diagnostic Cytology and Histology

Routine Diagnostic Cytology and Histology samples can be requested using a yellow headed Diagnostic and Molecular Pathology Request Form

5.7.8. Urgent Diagnostic Cytology and Histology

For Urgent diagnostic Cytology or Histology, these can be stated on the request form by ticking the appropriate box in the bottom left hand corner of the request form.

5.7.9. Samples for "2 week wait"

Samples for 2 week wait Cancer patients can be requested using 2 week wait orange headed forms.

5.7.10. NHS request forms are available from:

RCHT Supplies for hospital bases
Histopathology Department for Bodmin Treatment Centre
Histopathology Department for Dental Surgeries

5.7.11. Blood samples should be sealed in the attached bag and stored according to instructions on the reverse of the form (also see advice on A-Z of Services webpage). Please keep urine specimens, Liquid Base Cytology Specimens and anything containing Formalin, separate from bloods in order to avoid contamination issues.

5.7.12. The laboratory computer uses the patient's hospital number or the NHS number as the file accession number. The use of either of these numbers ensures correct patient identification and also speeds up sample processing. However, the NHS 10 figure number is regarded as a safer means of positive identification as the computer system automatically performs an integrity check.

5.7.13. Each sample must be in the appropriate container for the analysis required.

5.7.14. Samples for blood transfusion will not be accepted unless they bear the patient's family name, forename, NHS/hospital number and date of birth (not age) and are signed and dated. (Addressograph labels, or evidence of their attachment, must not be used on Blood Transfusion specimens).

5.7.15. Samples for Diagnostic and Molecular Pathology will not be accepted unless they bear three points of patient identification, signed by the requestor, have date and time of biopsy/sample, specimen and clinical details entered on the form. The sample container must be labelled with at least two patient identifiers and specimen site details including right or left side of body.

5.8. Containers and packaging

5.8.1. Specimens must be submitted in approved containers which are available from NHS Supplies for General Practice, Practitioner Support Services, Camberwell House, Grenadier Road, Exeter Business Park, Exeter EX1 3LQ Telephone : 01392 351351

5.8.2. Clinical Microbiology specimen containers may be obtained directly from the department (order line number (01872 25) 4966). Specimens should be placed inside the bag attached to the request form. Bulky specimens should be placed inside a large polythene bag, tied at the neck with the form attached to the outside.

5.8.3. If samples are not transported by the hospital courier service it is the responsibility of the requesting doctor to ensure that appropriate packaging is used to contain spillage in the event of an accident and that samples/requests are taken directly to the laboratory concerned under conditions which protect their integrity.

5.8.4. Occasionally patients deliver their own samples under direction from the requesting clinician, in which case all due care and attention must be given to the safe containment of the specimen and also protection of sensitive data (Data Protection Act)

5.8.5. Infectious samples - Due to the introduction of universal precautions in Pathology, it is no longer a requirement to use Danger of Infection labels. However, the nature of any infectious or potential infectious agent must be given in the clinical details

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5.9. Reference Facilities

All departments refer some specimens for primary or secondary testing to reference facilities. The lists at Appendix 5, whilst not comprehensive, give details of the primary facilities used

6. Dissemination and Implementation

6.1. All users of the Laboratory Service will be informed by email that the policy has been updated and where it can be located (via the Document Library and A-Z intranet page).

6.2. The previous version will be kept within the Document Library archives and Pathology controlled document archives

7. Monitoring compliance and effectiveness

7.1. This document is intended as a guide and therefore, does not require direct monitoring for compliance. Within Pathology there are mechanisms in place to monitor the quality of samples received, testing, reporting etc

8. Updating and Review

8.1. The document will be reviewed every three years by the author or sooner if developments require changes to the policy.

9. Equality and Diversity

9.1. This document complies with the Royal Cornwall Hospitals NHS Trust service Equality and Diversity statement which can be found in the 'Equality, Diversity & Human Rights Policy' or the Equality and Diversity website..

9.2. The Initial Equality Impact Assessment Screening Form is at Appendix 9.

APPENDIX 1. PATHOLOGY REPERTOIRE (by test, specimen or suspected infection)

Abbreviations in table

CC = Clinical Chemistry CMB = Clinical Microbiology
HAEM = Haematology BT = Blood Transfusion

Purple, pink & blue tubes MUST be mixed well as soon as possible to prevent clotting

Draw order – blue, yellow, green, purple, pink, grey

Specimen, Test or Suspected infection (in alphabetical order)	Sample volume (n/a if blank)	Which Lab?	Which tube? Note – mix purple, pink or blue tubes asap to prevent clotting	Remarks	Turnaround Time	Referred for testing to (see Reference Facilities information for details)
1, 25 Dihydroxy Vitamin D		CC	Li Hep or Red Top	send immediately to laboratory	up to 28 days	Southampton
25, Hydroxy Vitamin D	250ul	CC	Gold		up to 14 days	Derriford
5-HIAA (Plasma)		CC	EDTA or Li Hep plasma	Contact lab	up to 28 days	Leeds
17 OH-Progesterone	250ul	CC	Gold	Early morning sample- adult female follicular phase	up to 28 days	Southampton
Abacavir sensitivity		HAEM	EDTA	Must pre-arrange with Immunology	Up to 28 days	
Acanthamoeba		CMB		Sterile container with 2mls sterile saline. Contact laboratory to discuss. Do not refrigerate.	7 days	London School of Tropical Medicine
Acetyl Choline Receptor antibody	2ml	HAEM	Gold		11 - 21 days	Derriford
Actinomyces culture		CMB	IUCD	Clinical details must state PID	10 days	

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**Which tube?** **Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
				or other inflammatory conditions		
Acyl Carnitine		CC	Blood spots on Guthrie card		up to 28 days	Southmead
Adenovirus (enteric)		CMB	Fecon	Paediatric patients < 5yrs (outbreaks and other groups after discussion with Laboratory)	24hours	
Adverse reactions - anaphylactoid	2ml	HAEM	Gold		up to 28 days	
Adrenocorticotrophic hormone (ACTH)		CC	Purple	Preferably 9am sample (with a cortisol request)	up to 28 days	Southampton
Adrenal antibodies	2ml	HAEM	Gold		Up to 28 days	
Alanine Amino Transferase (ALT or ALAT)	5-10ml	CC	Gold	Part of Liver Profile	up to 4 hrs	
Albumin (Part of Liver and Bone profiles)	5-10ml	CC	Gold	Part of Liver and Bone profiles	up to 4 hrs	
Alcohol (Ethanol)		CC	Grey or Gold	Must record time of collection (Gold top received in lab asap)	up to 4 hrs	
Aldosterone	700ul	CC	Gold (if aldosterone only) EDTA (if require renin too)	**Take to lab asap** Diurectics, B-blockers, ACEi & Calcium-channel blockers discontinued for 2 weeks before sampling + treatment with aldosterone antagonists (e.g. spironolactone, oestrogens) must be discontinued for at least 6 weeks. Adequate sodium/potassium in diet	up to 28 days	Southampton
Alkaline Phosphatase	250ul	CC	Gold	Part of Liver and Bone profile	up to 4 hrs	

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**Which tube?** **Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
Alkaline Phosphatase Isoenzyme	250ul	CC	Gold	Measured if ALK Phos is high	up to 5 working days	
Alpha-1 Antitrypsin Phenotype	2 mL	CC	Gold		up to 28 days	BRI
Alpha-1 Antitrypsin Genotype		CC	Purple	Send whole blood	up to 28 days	Sheffield PRU
Alpha-1 Antitrypsin in Faeces		CC	Fresh and freeze		up to 28 days	St Georges
Alpha feto protein - Tumour marker	2ml	CC	Gold		up to 4 hrs	
Alpha-Galactosidase (FABRY Disease)		CC	Kit	Contact laboratory for a dried blood spot Fabry Kit	Up to 28 days	St Marys Hospital Manchester
Alpha - Sub units	1ml	CC	Red (no gel)		up to 28 days	Birmingham
Alphavirus	5-10 ml	CMB	Gold		10 days	PHE Porton Down
ALT (Alanine Amino Transferase)	5-10ml	CC	Gold	Part of Liver profile	4 h	
Aluminium		CC	Navy blue	Usually on Renal Dialysis patients	up to 28 days	Charing Cross
Amikacin	5-10ml	CC	Gold		1 - 2 wks	Southmead (micro)
Amino Acids- Blood	25ul	CC	Lith Hep		up to 28 days	Southmead
Amino Acids- CSF	25ul	CC	Plain	IBEM investigation- requires a paired blood sample	up to 28 days	Southmead
Amino Acids - Urine		CC	Plain	Freeze on day of collection	Up to 28 days	Southmead
Aminophyline	5-10ml	CC	Gold	As Theophylline	up to 4 hrs	
Amiodorone		CC	Red (no gel)		2 weeks	Penarth
Amitriptyline		CC	Red (no gel)		2 weeks	Penarth

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**Which tube?** **Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
Amoebiasis	5-10ml	CMB	Fecon container Gold	Three stool samples taken on separate days Blood if liver abscess suspected	1 day 10 days	Hospital for Tropical Diseases
Amylase	5-10ml	CC	Gold		up to 4 hrs	
ANCA (Anti Neutrophil Cytoplasmic Antibodies)	2ml	HAEM	Gold	Stable for up to 7 days if refrigerated (maximum time for add on tests)	1 – 2 wks	Derriford
Androstenidione	500ml	CC	Gold	Take in morning	1 - 2 wks	Southampton
Angiotensin Converting enzyme	250ul	CC	Gold	Must stop ACE inhibitors 24-36 hours prior to blood sampling	2 weeks	Torquay
Antenatal group & antibody screen	6ml	BT	Pink	Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature	24 hours	
Antenatal Haemoglobinopathy screen	3ml	HAEM	Pink	To be sent in with DH Family Origin Questionaire	3 days	Torbay if positive
Anti Cardiolipin antibodies	2ml	HAEM	Gold	Stable for up to 7 days if refrigerated (maximum time for add on tests)	11-21 days	Derriford
Anti Cholinesterase antibodies	2ml	HAEM	Gold		Up to 28 days	Derriford
Anti-Cyclic Citrullinated Protein (ACCP)	5-10ml	CC	Gold	Rheumatology request only	Done fortnightly	
Anti DNA	2ml	HAEM	Gold		11 - 21 days	
Anti DS (Double stranded DNA)	2ml	HAEM	Gold	Not directly requestable (added on at lab's discretion)	11 - 21 days	Derriford

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**Which tube?** **Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
Anti Ganglioside antibodies	2ml	HAEM			Within 28 days	Derriford
Anti Hepatitis A, B, C See Hepatitis	5-10ml*	CMB	Gold			
Anti Intrinsic Factor antibodies	2ml	HAEM	Gold		11 - 21 days	
Anti Mag antibodies	2ml	HAEM	Gold		Up to 28 days	Oxford
Anti-Mullerian Hormone (AMH)	2ml	CC	Gold	Obs& Gynae request only	Up to 21 days	Derriford
Anti Musk antibodies	2ml	HAEM	Gold		Up to 28 days	Oxford
Anti Neuronal Antibodies	2ml	HAEM	Gold		Up to 28 days	Inst of Neurology
Anti Neutrophil Antibodies	2ml	HAEM	Gold	Special Form - Immunology	11 - 21 days	Derriford
Anti Nuclear Antibodies	2ml	HAEM	Gold	Part of Autoantibody screen	11 - 21 days	
Anti Nuclear Cytoplasmic Antibody	2ml	HAEM	Gold		11 - 21 days	
Apt test		BT	Pink if testing blood	Other fluids eg vomit accepted	24 hours	
Anti Phospholipid Antibody		HAEM	Blue x 2 Gold x 2	Will include lupus anticoagulant screen	2wks	
Anti RO	2ml	HAEM	Gold	Part of Autoantibody screen	11 - 21 days	Derriford
Anti-streptococcal serology (ASOT)	5-10ml	CMB	Gold	ASO/ADB	10 days	Exeter
Antithrombin	iu/dl	HAEM	Blue	Part of thrombophilia screen	14 days	
Anti Tissue Transglutamase	2ml	HAEM	Gold	Coeliac test. Stable for up to 7 days if refrigerated (maximum time for add on tests)	11-21 days	Derriford
Antibiotic Assays	5-10ml	CC	Gold	Antibiotic assays	up to 4 hrs	
Anti XA heparin assay for LMWH	3ml	HAEM	Blue	Detail exact LMWH & last dose	7 days	
APCR		HAEM	Blue	Factor V Leiden screen performed instead	21 days	Derriford

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**Which tube?** **Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
Apolipoprotein-B (ApoB100)		CC	Gold/Green top		14 days	In house
Apolipoprotein-E Genotyping	5-10ml	CC	Purple	Send whole	up to 28 days	Bolton
APTT (for monitoring UF Heparin)	3ml	HAEM	Blue	Must reach the lab the same day	2 hrs	
APTT correction	3ml	HAEM	Blue	Performed if APTT prolonged for no identifiable reason	2 hrs	
Aquaporin 4 antibodies	2ml	HAEM	Gold		Up to 28 days	
Arbovirus serology	5-10ml	CMB	Gold	Give travel/exposure history & discuss with laboratory	10 days	PHE Porton Down
Arsenic		CC	Purple	Urine preferred (see Urine Arsenic). Stop eating fish/shellfish 5 days prior	up to 28 days	Guildford, Surrey
Aspartate Amino Transferase (AST or ASAT)	6ml	CC	Gold		up to 4 hrs	
Aspergillus serology	5-10ml	CMB	Gold		7 days	PHE Bristol
AST (Aspartate Amino Transferase)		CC	Gold		up to 4 hrs	
Atypical Respiratory Serology	5-10ml	CMB	Gold	Give clinical details/onset date. Acute & convalescent sera recommended	7 days	Exeter/Bristol
Atypical Serology		CMB	Gold		24 hours	
Auto Immune Profile (AIP) Paediatric		HAEM	Gold TBC		11 - 21 days	Derriford
Blood Cultures/ Bacteraemia/ Septicaemia	Refer to guide	CMB	Bact/Alert bottles	Refer to Blood Culture Guide on the Intranet Documents Library	48h (Preliminary)	
Bacterial vaginosis		CMB	Air-dried smear	Of vaginal discharge (transported in a slide box)	< 24 hrs	

Specimen, Test or Suspected infection (in alphabetical order)	Sample volume (n/a if blank)	Which Lab?	Which tube? Note – mix purple, pink or blue tubes asap to prevent clotting	Remarks	Turnaround Time	Referred for testing to (see Reference Facilities information for details)
Basement membrane antibodies	2ml	HAEM	Gold		11 - 21 days	
B12 (Vitamin B12)		CC	Gold		up to 4 hrs	
BCR Abl	2x4ml	HAEM	2 x purple	Only available on Consultant Haematologist referral	Up to 28 days	
Bence Jones Protein (BJP)		HAEM	Urine container		7 - 10 days (up to 14 days if immunofixation is necessary)	
Beta Carotene	500 uL	CC	Red		up to 28 days	Birmingham
Beta Hydroxybutryric acid		CC	Grey	For Hypoglycaemia	1 wk	Southmead
Beta 2 Microglobulin		CC	Gold		Up to 5 working days	
Beta HCG (Beta Human Chorionic Gonadotrophin)		CC	Gold	Only requested by EPU for ectopic pregnancy or Used as Tumour Marker with AFP	up to 4 hrs	
Bicarbonate		CC	Gold	Part of Electrolytes / U&E	up to 4 hrs	
Beta – 2- Transferrin (Asialo transferrin)	Few Drops	CC	Nose/Ear discharge	?CSF cause for rhinorrhea or otorrhe	21 days	UCL
Bile Acids		CC	Gold		up to 5 w. days	
Bilirubin		CC	Gold	Part of Liver Function	up to 4 hrs	
BK Virus	5-10ml	CMB	Urine (not Boric)	Please discuss with laboratory	10 days	PHE Bristol
Bleeding time		HAEM	N/A	Patient tested directly – discuss with Consultant Haematologist	1 day	
Blood Count (inc film)	4ml	HAEM	Purple	Sample will remain stable overnight if refrigerated (max time for add on tests). Usually	<24hrs	

Specimen, Test or Suspected infection (in alphabetical order)	Sample volume (n/a if blank)	Which Lab?	Which tube? Note – mix purple, pink or blue tubes asap to prevent clotting	Remarks	Turnaround Time	Referred for testing to (see Reference Facilities information for details)
				tested by 2000hrs		
Blood Group	6ml	BT	Pink	Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature	<24 hrs	
Blood gases acid base	2mL	CC	Blood gas syringe			
Bone (Calcium, Phosphate, Total Protein, Albumin, Alkaline Phosphatase)		CC	Gold		up to 4 hrs	
Botulism	5-10ml	CMB	Gold Faeces (Fecon)	Discuss with Consultant Microbiologist ASAP before submission of specimens Toxin testing Culture and toxin testing		
Brucellosis – culture		CMB	Blood culture sets x 3	30ml of blood (total in 3 bottles)	3 weeks	
Brucellosis – serology	5-10ml	CMB	Gold	Give exposure/travel histol	7 days	PHE Bristol
C1 Esterase	2ml	HAEM	Gold		11 - 21 days	Derriford
C-Peptide		CC	Gold	Send immediately to lab	up to 28 days	Southampton
CA125	1 ml	CC	Gold		up to 4 hrs	
CA15-3	1 ml	CC	Gold		up to 28 days	Sheffield PRU
CA19-9	1ml	CC	Gold		up to 28 days	Derriford
Cadmium		CC	Purple	Send whole blood or urine	1 - 2 wks	Charing Cross
Calcitonin		CC	Gold	Contact lab prior to collection. Sample on ice, ASAP to lab	up to 28 days	Charing Cross

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Calculi		CC		Please state location of calculi	up to 28 days	City Hospital Birmingham
Campylobacter serology	5-10ml	CMB	Gold	Indicated in the investigation of Guillain-Barre syndrome	10 days	Preston Microbiology Services
Carboxyhaemoglobin	1 mL	CC	Green			
Carbohydrate Deficient Transferrin- ? Alcohol Use		CC	Gold		up to 28 days	Kings
Carbohydrate Deficient Transferrin- Paediatric		CC	Paediatric clear top			Institute of Neurology Queen's Square
C Reactive protein		CC	Gold		up to 4 hrs	
C3 and C4		CC	Gold		up to 4 hrs	
Calcium (normally part of Bone Profile)		CC	Gold	Part of Bone profile	up to 4 hrs	
Calprotectin		CC	Faecal Sample	Only requested by Gastroenterology and Paediatrics	Up to 5 working days	
Carbamazepine (same as Tegretol)		CC	Gold	Anti-epileptic. Trough (pre-dose) sample required	up to 4 hrs	
Carcinoembryonic Antigen (CEA)		CC	Gold		up to 4 hrs	
Cardiolipin (See Anti-Cardiolipin)	2ml	HAEM	Gold		11 - 21 days	Derriford
Carnitine		CC	Li Hep		up to 28 days	Sheffield (Childrens)
Catecholamines - Blood		CC		See metanephrines	up to 28 days	
Cat Scratch Disease (Bartonella)	5-10ml	CMB	Gold		10 days	PHE Bristol

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CD 34	4ml	HAEM	purple	Only on Consultant Haematologist referral		
CD 59	2x4ml	HAEM	Purple x 2	Only on Consultant Haematologist referral	Within 24 hrs	
Cell Markers	4x4ml	HAEM	Purple x 4	Only on Consultant Haematologist referral	Within 24 hrs	
Chlamydia trachomatis detection		CMB	Urine (male) Swab (female)	See Virology section for more details	3 days	
Chlamydia trachomatis serology	5-10ml	CMB	Gold	Only used for Fertility testing	1 week	PHE Bristol
Chitotriosidase		CC	EDTA	Only on known Gaucher cases	up to 28 days	BRI
Cholinesterase		CC	Gold		2 wks	Penarth
Chromium and Cobalt		CC	Trace Metals Tube	Order tube from Chemistry. For MOM patients		Charing Cross
Clomipramine		CC	Red (no gel)		up to 28 days	Penarth
Clonazepam		CC	Li Hep, EDTA, SST		up to 28 days	NSE
Clostridium difficile	5-10ml	CMB	Fecon container	GDH screening assay 7 days a week. Toxin detection by Cytotoxin assay Monday to Friday and by rapid toxin A/B test at weekend. Also available on special request at other times	Same day for GDH and rapid toxin A/B test. 16-24 hours for cytotoxin assay.	
Clotting screen Paediatric	3ml 1.3ml	HAEM	Blue Dark Blue screw	Must reach the lab the same day. Available on request from lab.	<4 hrs	

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			top			
CMV Antibody Cytomegalovirus IgM/IgG	5-10ml	CMB	Gold	Give reason for test (e.g. ?acute CMV infection vs previous exposure)	5 days	
CMV PCR viral load		CMB	Purple		5 days	PHE Bristol
Coagulation screen (TCT+Fibrinogen-derived)	3ml	HAEM	Blue		2 hrs	
Coeliac test	2ml	HAEM	Gold	See Anti-tissue transglutaminase	11-21 days	Derriford
Cold Agglutinins	6ml	BT	Red	Keep at 37°C	24 hours	
Complement (C3 and C4)		CC	Gold		up to 4 hrs	
Conjunctivitis	n/a	CMB	Charcoal swab UTM swab (viruses)	Bacteriology Virology if etiology suspected	2 days 3 days	
Coombs test (direct antiglobulin test)	6ml	BT	Pink	Can be performed on purple EDTA	24 hrs	
Copper		CC	Gold		up to 28 days	Derriford
Corneal scrape		CMB		Always contact laboratory to provide a sample collection kit.	Gram 1 hour Culture 2 days	
Cortisol		CC	Gold	Preferable 9am	up to 4 hrs	
Corynebacterium diphtheriae/ ulcerans	n/a	CMB	Charcoal swab	Give clinical details including contact/exposure – Further Info	3 days	
Cough swab	n/a	CMB	Charcoal swab	Cystic fibrosis or ciliary dyskinesis patients only	3 days	Routine
Creatine Kinase (CK/TCK)		CC	Gold	Muscle or Heart Muscle	up to 4 hrs	
Chromogranin A &B (also part of the gut hormone profile)	1 mL	CC	EDTA on ice	Patient should fast overnight and H2 blockers should be stopped for 72h, and	2 weeks	Hammersmith

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				omeprazole for 2 weeks, before blood is taken. Send sample to lab on ice ASAP		
Cross Match	6ml	BT	Pink	Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature		
CRP		CC	Gold		up to 4 hrs	
Cryoglobulin (for Cryoprotein)		CC	Gold	Do not take on a Friday. Keep at 37 degrees C	up to 5 w. days	
Cryptosporidum oocysts		CMB	Fecon container	Clinical details essential (Further info crypto)	2 days	
CSF Oligoclonal Bands	0.5 mL	CC	Plain pot for CSF, with paired blood sample (Gold)	Requires blood sample and CSF	10 days	Derriford
CSF Microbiology		CMB	Universal container	Phone if micro required urgently	1 hr	
CSF Microbiology (Culture)		CMB	Universal container	Further info CSF link	48h	
CSF Microbiology (Viral PCR)		CMB			7 days	PHE Bristol
CSF Chemistry for Protein and Glucose	1 ml	CC	Plain sterilin pot		up to 4 hrs	
CSF Tumour Markers (HCG,AFP)		CC	Plain sterilin pot	For Pineal Tumours	28 days	Charing Cross
CSF Xanthochromia	1 mL	CC	Plain	Should be 4th Sample, delivered to lab by hand, protected from light, asap. Please state timing since onset of symptoms	up to 24 hrs	

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CSF Haematological investigation		HAEM	Universal		24h	
Cyanide		CC	Purple	Send whole sample	up to 28 days	Penarth
Cyclosporin (Adult)		CC	Purple	Whole blood - Trough	up to 5 working days	Derriford
Cyclosporin (Paediatrics)		CC	Purple	Whole blood - Trough	up to 5 working days	BRI
Cytogenetics		HAEM	Various dependant on sample type	Only haematology patients referred by Haematology lab	Within 28 days	
Cytogenetics (Chromosomal analysis)		CC	Li Hep	Preferably on genetics form with consent forms.	Lab will post samples but does not handle results	Bristol Genetics
Cystine (Cystinuria Screening)		CC	Plain urine, random	(known cystinuria- see urine collection section)		Southmead
DAG / DAGT (Direct Antiglobulin Test) (Coombs Test)	6ml	BT	Pink	Can be performed on purple EDTA	<24 h	
D-Dimer	3ml	HAEM	Blue	Reason ?DVT/PE/DIC	2 hrs	
7-Dehydrocholesterol		CC	Green		up to 28 days	Sheffield Childrens
Dengue Fever	5-10ml	CMB	Gold		10 days	PHE Porton Down
11-Deoxycortisol	5-10ml	CC	Gold		up to 28 days	St Thomas' London
Desipramine	1 mL	CC	Red	Pre-dose (trough) sample required	up to 28 days	Penarth
Diazepam		CC	Green/Purple/SST		1 week	NSE
Differential White Blood count	4ml	HAEM	Purple		3d	
Digoxin	5-10ml	CC	Gold	At least 6hr post dose	up to 4 hrs	
1,25-Dihydroxycholecalciferol		CC		See 1, 25 dihydroxy vitamin D		
Diphtheria		CMB	Charcoal	Further info (Throat swabs)	3 days	

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Direct Antiglobulin Test	6ml	BT	Pink	Can be performed on purple EDTA	24 hours	
Direct Coombs test	6ml	BT	Pink	Can be performed on purple EDTA	24 hours	
Dothiepin		CC	Red	Trough Sample	up to 28 days	Penarth
Down's Screening- 1st Trimester	5-10ml	CC	Gold	Sample taken in Fetal Medicine, after nuchal measurement		
Down's Screening- 2nd Trimester	5-10ml	CC	Gold	15+0 to 20+0 weeks gestation. Sample MUST be received by our laboratory within 24 hours of being collected		Newcastle
DNA Analysis (Genetics)		CC	Purple	Preferably on genetics form with consent forms.	Lab will post samples but does not handle results	Exeter and Bristol Genetics
Dual esterase		HAEM		Haem Consultant request only	7 - 10 days	
EBV (Epstein Barr Virus)	5-10ml	CMB	Gold EDTA	Serology PCR viral load (discuss first with laboratory)	4 days 5 days	PHE Bristol PHE Bristol
Ear swab		CMB	Charcoal swab		3 days	
Electrolytes (Sodium - Na , Potassium - K, Urea, Creatinine)	5-10ml	CC	Gold		up to 4 hrs	
ENA	2ml	HAEM	Gold	Part of Autoantibody screen	11 - 21 days	Derriford
Encephalitis	5-10ml	CMB	Gold vacutainer CSF	Discuss with Medical Microbiologist		PHE Bristol

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Endocarditis	5-10ml	CMB	Blood culture Gold vacutainer	3 sets from separate venepuncture sites Clotted blood for serology	48hrs (preliminary) 10 days	
Endomysial Antibodies	2ml	HAEM	Gold	Request TTG	11 - 21 days	
Enteric fever		CMB	Blood culture Faeces Urine (typhoid)	Consult medical microbiologist	48hrs (preliminary)	
Erythropoetin (EPO)	2ml	HAEM	Gold		up to 28 days	King's
Erythrocyte sedimentation rate	4ml	HAEM	Purple		24h	
Ethosuximide	1mL	CC	Green / Purple/SST	Pre-dose (trough) sample required	1 week	NSE
Ethyleneglycol	1mL	CC	Grey	Taken > 4hrs post ingestion. Phone lab prior	2 days	Penarth
Extractable nuclear antigen	2ml	HAEM	Gold	Part of autoantibody screen	11 - 21 days	
Factor V	3ml	HAEM	Blue		2 wks	
Factor V Leiden	3ml	HAEM	Blue	Part of thrombophilia screen	3 wks	Sent to Derriford
Factor VII	3ml	HAEM	Blue		2 wks	
Factor VIII (C assay)	3ml	HAEM	Blue		2 wks	
Factor IX	3ml	HAEM	Blue		2 wks	
Factor X or XI assay	3ml	HAEM	Blue		2 wks	
Factor XI	3ml	HAEM	Blue		2 wks	
Factor XII	3ml	HAEM	Blue		2 wks	
Factor XIII	3ml	HAEM	Blue		2 wks	
Faecal Elastase		CC	Plain universal		up to 5 w. days	

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Faecal Occult Blood		CC	Plain	Paediatrics and Private patients only		Leeds
Faeces (culture)	n/a	CMB	Fecon container	Minimum 'Cherry sized portion' (5 – 10 ml if liquid) (Further info Faeces)	3 days	
Faeces (ova, cysts & parasites)	n/a	CMB	Fecon container	As above, plus relevant clinical details (Further info Faeces)	1 day	
Fasting Glucose		CC	Grey		up to 4 hrs	
FBC	4ml	HAEM	Purple		24h	
FBC and Hb Electrophoresis	4ml	HAEM	Purple		24h	
Fertility testing		HAEM		Please send request to Coagulation when appointment & tube will be sent to patient		
Ferritin	5-10ml	CC	Gold		up to 4 hrs	
Fibrin monomers	3ml	HAEM	Blue		2 hrs	
Fibrinogen	3ml	HAEM	Blue		2 hrs	
Filaria	4ml	HAEM	Purple		24h	
Film (blood)	4ml	HAEM	Purple		3d	
FK506		CC	See Tacrolimus			
Flavirus (see Arbovirus)	5-10ml	CMB	Gold	See Arbovirus	10 days	PHE Porton Down
Flecanide	5-10ml	CC	Red	Pre-dose (trough) sample required	up to 28 days	Penarth
Flu A & B and other respiratory viruses		CMB	UTM –nose & throat swabs, NPA Sputum BAL Bronchial washings	PCR Test available Monday to Friday – call laboratory	<24 hrs	

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Fluid cell counts (Ascitic, Pleural etc)		HAEM	Plain		24h	
Folate	5-10ml	CC	Gold		4 h	
Free T3	pmol/l	CC	Gold		up to 24 h	
Free T4	pmol/l	CC	Gold		up to 24 hrs	
Free serum light chains	5-10ml	CC	Gold		2 weeks	Taunton
Free Fatty Acids		CC	Grey	Investigation of Hypoglycaemia	21 days	Southmead
Fructosamine	5-10ml	CC	Gold	Only required in some diabetic patients where HBA1c is not reliable	2 weeks	Reading
FSH (Follicle Stimulating Hormone)	5-10ml	CC	Gold		up to 4 hrs	
Full Blood Count (FBC) Paediatric	4ml 1ml	HAEM	Purple Pink top	Available on request from lab.	24h	
FVIII Gene mutation		HAEM	4 x purple	Processed by coagulation on request of Consultant Haematologist only	3 wks	Specialist centre
FVIII & FVIII inhibitor	3ml	HAEM	1 blue		2 wks	
Fungal culture & microscopy (See Mycology)		CMB	See Mycology	Microscopy Culture (negative/positive)	24hr 2/4 weeks	
Fungal serology	5-10ml	CMB	Gold vacutainer	Farmer's lung etc	7 days	PHE Bristol
GAD antibodies	2ml	HAEM	Gold	Must state if for diabetes or stiff person syndrome	Up to 28 days	Derriford
Galactomanin	5-10ml	CMB	Gold		7 days	PHE Bristol
Galactose-1-Phosphate-Uridyl-Transferase	5 mL	CC	Green	If tranfused measure Galactose-1-phosphate (Li Hep	2 weeks	Southmead

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				whole blood) or do GPUTR with mother.		
Gamma GT		CC	Gold		up to 4 hrs	
Gastric Parietal cells	2ml	HAEM	Gold	Request intrinsic factor antibody	11 - 21 days	Derriford
Gastrin	1 mL	CC	EDTA on ice	Patient should fast overnight and H2 blockers should be stopped for 72h, and omeprazole for 2 weeks, before blood is taken. Send sample to lab on ice ASAP	2 weeks	Hammersmith
Gaucher Disease screen		CC	EDTA		up to 28 days	Bristol Royal Infirmary
GBM antibodies	2ml	HAEM	Gold		Up to 28 days	Derriford
Gentamicin	5-10ml	CC	Gold	Sample must be trough in once daily regime	up to 4 hrs	
Genital tract swabs (see separate section for Chlamydia and Herpes Simples)	n/a	CMB	Charcoal swab	High/low vaginal, cervical, vulval	3 days	
German Measles (Rubella)	5-10ml	CMB	Gold		3 days	
GGT (Gamma G T)	5-10ml	CC	Gold		up to 4 hrs	
Giardia trophozoites		CMB	Fecon container	Deliver to lab as soon possible (Further information Faeces)	1 day	
Glandular fever (see also under Infectious mononucleosis)	5-10ml	CMB HAEM	Gold Gold/Purple	Paul Bunnell test in typical cases, otherwise see EBV	5 days	

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Glucose		CC	Gold <3 hours Grey if longer	Record time of collection	up to 4 hrs	
Glucose 6 Phosphate Dehydrogenase (G6PD)	3ml (or 0.5ml)	HAEM	Purple (Pink Paeds)	Mark if urgent	up to 2 days	
Glycosylated Haemoglobin (HbA1c)		CC	Purple		up to 24 hrs	
Gonorrhoea		CMB	Charcoal swab (male urethral orange top) PCR testing available to Sexual Health Services- see Virology section for details	Genital info HVS **NOT** cultured for GC	3 days	
Group and save	6ml	BT	Pink	Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature	24 hrs	
Group and antibody screen	6ml	BT	Pink	Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature	24 hrs	
Growth Hormone	5-10ml	CC	Gold	Random growth hormone uninformative. Should only be done as part of dynamic function test	1 week	Derriford

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Gut hormone profile (Gastrin, VIP, glucagon, chromogranin A&B, somatostatin, PPP & CART)		CC	EDTA on ice	Patient should fast overnight and H2 blockers should be stopped for 72h and omeprazole for 2 weeks, before blood is taken. Send sample to lab on ice ASAP	up to 28 days	Hammersmith
Haemachromatosis Genetic screen (HFE)	5-10ml	CC	Purple	Must confirm raised iron saturation and ferritin before requesting.	up to 28 days	Derriford
Haematinics, Iron, B12, Ferritin, Folate		CC	Gold		up to 4 hrs	
Haemoglobin A1c		CC	Purple		up to 24 hrs	
Haemoglobinopathy screen / Haemoglobin Electrophoresis (incl HBA2 & HbF)	4ml	HAEM	Purple	Stable for up to four days if refrigerated.	3 wks	Torbay
Haemoglobin H	4ml	HAEM	Purple		3 wks	
Haemoglobin S	4ml	HAEM	Purple		3 wks	Torbay
Haemosiderin (urine)		HAEM	MSU		Within 24 hrs	
Haptoglobin	5-10ml	CC	Gold		up to 4 hrs	
HbA1c (Haemoglobin A1C)		CC	Purple		up to 24 hrs	
HCO3	mmol/l	CC	Gold	Part of Electrolytes / U&E	up to 4 hrs	
HCG (Human chorionic gonadotrophin)	5-10ml	CC	Gold		up to 4 hrs	
Heinz bodies	4ml	HAEM	Purple		2 wks	
Helicobacter antibodies (H. Pylori antibodies)	5-10ml	CMB	Gold	Cannot be used to monitor response to treatment	3 days	
Hepatitis A serology	5-10ml	CMB	Gold	Indicate whether immunity	5 days	

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				screen or diagnostic test is required		
Hepatitis B surface antigen	5-10ml	CMB	Gold	Screening test for HBV infection. Urgent testing available, contact laboratory	4 days (same day for urgent tests)	
Hepatitis B immunity	5-10ml	CMB	Gold	Give vaccination details	9 days	
Hepatitis B DNA detection (viral load)	5-10ml	CMB	Gold	At request of Hepatologist	10 days	Micropathology
Hepatitis C Antibody status	5-10ml	CMB	Gold	Antibodies not normally detectable for up to 3 months after date of onset	4 days	
Hepatitis C RNA detection (viral load)	5-10ml	CMB	Gold		7 days	
Hepatitis C Genotype	5-10ml	CMB	Gold	At request of Hepatologist	10 days	PHE Addenbrookes, Cambridge
Hepatitis E IgM	5-10ml	CMB	Gold	Performed routinely in acute hepatitis (ALT >400iu/ml)	5 days	
Herpes simplex virus PCR		CMB	UTM swab	Swab from base of lesion or vesicle fluid/crusts	3 days	
HIT		HAEM	**Check with Haematology Lab prior to sending request**	Special NHSBT form required (available from lab)	7 - 10 days	NHSBT Bristol
HIV Antibody status	5-10ml	CMB	Gold	Request form must be completed and signed by requestor	3 day	
HIV RNA detection (Viral Load)		CMB	Purple	Adults (in-house) Paediatrics (referred)	7 days 10 days	PHE Colindale
HLA ABC + DR (only by	4x4ml	HAEM	EDTA x 4	Must only take if Lab approves	7 - 10 days	

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contacting lab)			Gold x 2			
HLA B27 (Monday to Thursday)	2x4ml	HAEM	EDTA x 2	Only Monday - Thursday	7 - 10 days	
Homocystine		CC	Purple on ice	Spin and freeze plasma in under 30 minutes	up to 28 days	BRI
Hormones - See individual listings		CC			4 h	
HTLV 1 and 2 Antibody	5-10ml	CMB	Gold		14 days	Derriford, Plymouth
Human chorionic gonadotrophin (HCG)	5-10ml	CC	Gold		4 h	
Hydatid diseae (Echinococcus serology)	5-10ml	CMB	Gold	Discuss with Medical Microbiologist	14 days	Hosp for Tropical Diseases (London)
Hydroxycalciferol		CC	See Vitamin D		up to 28 days	
Hydroxyprogesterone	5-10ml	CC	See 17-OH-progesterone			
Hypochromia (% rbc)	4ml	HAEM	Purple		24h	
IG antibodies (Haemophilus and Pneumococcus)		HAEM	Gold		11 - 21 days	
Ig Sub-class	2ml	HAEM	Gold		11 - 21 days	
IgA	g/l	CC	Gold	Part of Immunoglobulins	up to 4 hrs	
IgE and Rast	7ml*	HAEM	Gold	Must list likely allergens *(for up to 6 allergens)	11 - 21 days	
IgG	g/l	CC	Gold	Part of Immunoglobulins	up to 4 hrs	
IgG4	2ml	HAEM	Gold	Only by prior arrangement with Haem Lab		
IgM	g/l	CC	Gold	Part of Immunoglobulins	up to 4 hrs	
ILGF1 (Insulin Like Growth Factor)	5-10ml	CC	Gold		up to 28 days	Derriford

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Imipramine		CC	Red	Trough level	up to 28 days	Penarth
Infectious Mononucleosis screen	4ml	HAEM	Purple	Up to four days if refrigerated	< 24h	
Immuno phenotyping (Cell Markers)	4x4ml	HAEM	Purple x 4	Haem consultant request only	Within 24 hrs	
Immunoglobulins (includes Protein electrophoresis)	g/l	CC	Gold	Ig A, G and M plus protein electrophoresis	up to 48 hrs	
Infectious disease serology	5-10ml	CMB	Gold	See individual targets		
Influenza A & B (See 'Flu A&B')		CMB	See 'Flu A&B'	See 'Flu A&B'	Same day Monday to Friday	
Inhibitor - Factor V111 or IX,	3ml	HAEM	Blue		2 wks	
Inhibitor screen	3ml	HAEM	Blue x 2		2 wks	
INR / Prothrombin Time	3ml	HAEM	Blue	Stable overnight if refrigerated	<24 hrs	
Insulin	5-10ml	CC	Gold	Must be accompanied by a lab glucose result <2.5mmol/L	up to 28 days	Southampton
Insulin Antibodies		HAEM	Contact Lab		up to 28 days	
Insulin like growth factor (ILGF1)		CC	Gold or LiHep		up to 28 days	Southampton
Insulin like growth factor binding protein 3 (ILGF-BP3)		CC	Red (no gel) Paeds clear top		up to 28 days	Guildford
Intrinsic factor	2ml	HAEM	Gold			
Ionised Calcium	5-10ml	CC	Gold		up to 4 hrs	
Iron,Transferrin and Iron Saturation	5-10ml	CC	Gold		up to 4 hrs	
Iron stain		HAEM	Purple	Routinely measure ferritin unless clinical details support request	Within 24 hrs	
Iron Studies (Ferritin)	5-10ml	CC	Gold	If require Iron & Iron Saturation	up to 4 hrs	

Specimen, Test or Suspected infection (in alphabetical order)	Sample volume (n/a if blank)	Which Lab?	Which tube? Note – mix purple, pink or blue tubes asap to prevent clotting	Remarks	Turnaround Time	Referred for testing to (see Reference Facilities information for details)
				please specifically request		
Islet cell antibodies		HAEM	Gold		Up to 28 days	
Itraconazole	5-10ml	CC	Gold, Red		up to 28 days	Royal Brompton
JAK 2	4ml	HAEM	Purple	Only by Consultant Haematologist referral		
JC Virus	5-10ml	CMB	Gold and CSF	Discuss with Laboratory	10 days	VRD Colindale
Kaolin clot time	3ml	HAEM	Blue	Specialist lupus screen test	2 wks	
Kleihauer	6ml	BT	Pink	The maternal sample should be taken 30-45 minutes after the sensitising event. Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature	24 hrs	
Lactate		CC	Grey	Taken to lab immediately on ICE (< 10 minutes)	up to 4 hrs	
Lactate Dehydrogenase / LD / LDH	5-10ml	CC	Gold	Samples stored at +4c are unsuitable for analysis.	up to 24 hours	
Lassa fever		CMB	DO NOT SEND SPECIMENS	Consult medical microbiologist and inform CCDC immediately upon diagnosis		
LD (Lactate Dehydrogenase)	5-10ml	CC	Gold		up to 5 w. days	
LD isoenzymes	5-10ml	CC	Gold		up to 5 w. days	
Lamotrigine		CC	Green/SST/EDTA	Trough sample	up to 28 days	NSE

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Lead		CC	Purple		up to 28 days	Derriford
Leg ulcer swab		CMB	Charcoal swab	Further ulcer swab information	3 days	
Legionella (sputum, lung biopsy, bronc washings, pleural fluid)		CMB	Universal container	Culture may still be successful after antimicrobial therapy commenced	up to 7 days	
Legionella Urinary Antigen detection		CMB	Sterile urine container (NOT boric)	Positive for up to 10 days. This test replaces blood serology	1 days	
Leishmaniasis serology	5-10ml	CMB	Gold	Positive in visceral Leishmaniasis only. Tissue required for cutaneous infection	2 weeks	Hospital for Tropical Diseases
Leptospirosis	5-10ml	CMB	Gold	Give exposure details	Up to 7 days	Microbiology Hereford
LFT (Total Protein, Albumin, Alkaline Phosphatase, ALAT, Bilirubin	5-10ml	CC	Gold		up to 4 hrs	
LH (Luteinising Hormone)	5-10ml	CC	Gold		up to 4 hrs	
Lipase	5-10ml	CC	Gold		up to 28 days	Southmead
Lipids (Chol, Trig, HDL, LDL)	5-10ml	CC	Gold	No longer requires fasting	up to 4 hrs	
Listeriosis		CMB	Blood culture CSF Charcoal swab	Consult Medical Microbiologist Serology not available	2 days	
Liver Function Test (Total Protein, Albumin, Alkaline Phosphatase, ALT, Bilirubin)	5-10ml	CC	Gold		up to 4 hrs	
Liver autoantibodies		HAEM	Gold			Derriford
LMW Heparin	3ml	HAEM	Gold		1 week	

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Lower Respiratory Tract Infection		CMB	Universal container	Sputum/Bronchoalveolar lavage	3 days	
Lupus screen		HAEM	Blue x 2 Gold x 2	Part of Antiphospholipis screen	2 wks	
Lyme disease serology *(Borrelia burgdorferi)*	5-10ml	CMB	Gold	Give date of onset & clinical details. IgG antibodies are detectable from 6 weeks after onset of symptoms	2 days	
Lymphogranuloma venereum (LGV)		CMB	Gold for serology. Chlamydia swab of lesion for PCR	LGV specific PCR is the most reliable test	7 days	PHE Colindale
Magnesium		CC	Gold	Note time of collection	up to 4 hrs	
Malarial Parasites	4ml	HAEM	Purple		24h	
Manganese		CC	Purple	Take one tube and discard. Use 2nd tube for manganese request only	up to 28 days	Birmingham
Marrow staining (MGG)		HAEM	EDTA	Haem patients only	Within 24 hrs	
Mast cell tryptase	2ml	HAEM	Gold	**2 samples required – 1 hour apart.** 1st sample **must** be taken within 1 hour of acute event. 2nd sample to be taken 1 hour after 1st. Note time of collection and event.		Derriford
Measles (diagnostic)		CMB	Salivary kit (Supplied by HPU)	Request salivary kits from Public Health England, St Austell 01726 627880		

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	5-10ml		Gold (serology)	Give clinical details/date of onset	10 days	PHE Bristol
Measles (immunity)	5-10ml	CMB	Gold	Please discuss with Laboratory	5 days	
Meningitis (bacterial)		CMB	CSF Blood culture Throat swab	Discuss with Cons Med Microbiologist. Notify CCDC. Swabs from contacts if patient has had treatment prior to admission	Micro – 1 hour Culture 2 days	
Meningitis/Encephalitis (Viral)		CMB	CSF	Herpes simplex, Varicella, Enterovirus, Enterovirus performed routinely. Otherwise discuss with Laboratory	7 days	Microbiology, Addenbrookes
Meningococcal/Pneumococcal PCR		CMB	EDTA Pink (paeds) EDTA Purple CSF		7 days	Meningo Ref Unit, Manchester
Mercury		CC	Purple		up to 28 days	Guildford, Surrey
Metanephrines		CC	Purple on ice	Only in patients with equivocal urinary catecholamines. Contact lab before sending.	Up to 28 days	Feeman Hosp, Newcastle
Methanol		CC	Grey	Inform laboratory prior to sending		Penarth
Methotrexate		HAEM		Arrange with Derriford at 0500hrs		
Microfilaria	4ml	HAEM	Purple		24h	
MRSA screening (minimum nose & and other site)		CMB	Red	Hospital patients GP/Community patients State if patient receiving suppression therapy.	24 hr (neg) 3 days (pos)	

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Mumps (diagnostic)		CMB	Salivary kit	Public Health England St Austell	10 days	VRD, PHE Colindale
Mumps serology	5-10ml	CMB	Gold	May be used diagnostically. Not recommended for determining immunity to Mumps	10 days	VRD, PHE Colindale
Mycology (skin, nails, hair)		CMB	Dermapak	Microscopy Culture negative/positive	24h 2 /4 weeks	
Mycophenolic acid (Mycophenylate)		CC	Purple	Take >12 hours post dose	up to 28 days	Kings
Mycoplasma	5-10ml	CMB	Gold		7 days	Exeter
Nasal swabs		CMB	Charcoal swab		2 days 24 hrs nasal screens	
NHSBT referrals	2 x 6ml	BT	pink	Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature	Up to 7 days	NHSBT Bristol
Neonatal Allo neutropenia antibodies		HAEM	See NHSBT form for details	Contact Lab for special NHSBT form	11-21 days	NHSBT Bristol
Neonatal Allo Thrombocytopenia antibodies		HAEM	See NHSBT form for details	Contact Lab for special NHSBT form	11-21 days	NHSBT Bristol
Neutrophil antibodies		HAEM	See NHSBT form for details	Contact lab for special NHSBT form	11 - 21 days	NHSBT Bristol
Neuron specific enolase (NSE)	5-10ml	HAEM	Gold		up to 28 days	PRU Sheffield
Norovirus		CMB	Fecon container	For same day testing, must arrive at the laboratory by	<24 hours Monday to	

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				1200hrs. Requested via Infection Control Teams or HPU only	Friday	
Oestradiol	5-10ml	CC	Gold	Please state which form of HRT patient is on	Up to 8 days, unless requested urgently	
Oligoclonal bands – see CSF Oligoclonal bands		CC				
Ovarian antibodies	5ml	HAEM	Gold		Up to 28 days	Derriford
Paraneoplastic antibodies	2ml	HAEM	Gold		Up to 28 days	Derriford
Parasites (Microscopy)		CMB	Fecon container	Minimum “Cherry sized” portion (Further information FAECES)	24h	
Parathyroid Hormone (PTH)	nmol/l	CC	Gold	Must be processed within 4 hours	up to 4 hrs	
Parvovirus B19 Antibody studies		CMB	Gold	*“Slapped Cheek”* Must state date of onset and clinical details supporting diagnosis e.g. rash, arthritis, hydrops foetalis	7 days	PHE Bristol
Paul Bunnell (Glandular fever test) IMS Infectious Mononucleosis screen	4ml	HAEM	Purple		24h	
Peptide Histidinemethionine		CC	Special	Li Hep containing Trasylol	up to 28 days	
Phenylalanine		CC	Green	Only for monitoring PKU patients	up to 28 days	Southmead
Philadelphia Chromosome		HAEM	2 x EDTA	Haem consultants only	11 - 21 days	Derriford
Phlebovirus	5-10ml	CMB	Gold		10 days	PHE Porton Down

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Phosphate (Normally Part of Bone profile)	5-10ml	CC	Gold	Part of Bone profile	up to 4 hrs	
PID (Pelvic Inflammatory disease)/salpingitis		CMB	IUCD or aspirate from fallopian tube/TOA	Further information PID Send endocervial or vulvo-vaginal swabs for Chlamydia PCR in addition	2 days	
Placental swab		CMB	Charcoal swab	Taken post delivery	2 days	
Plasma Osmolality	5-10ml	CC	Gold		up to 4 hrs	
Plasma Viscosity	4ml	HAEM	Purple	Do not refrigerate keep at room temp.	7 days	Derriford
Platelet autoantibodies		HAEM	See NHSBT form for details	Contact lab for special NHSBT form	Up to 28 days	NHSBT Bristol
Platelet aggregation (by arrangement with Lab only)	12ml	HAEM	Blue x 4	By arrangement with lab only		
Platelet antibodies (special form from lab)		HAEM	See form	Contact lab for special NHSBT form	11 - 21 days	NHSBT Bristol
Platelet function	12ml	HAEM	Blue x 4	By arrangement & immediate processing	2 wks	
Platelet nucleotides	12ml	HAEM		By arrangement & immediate processing		
Platelet neutralysation	12ml	HAEM	Blue	Specialist Lupus screen test		
Pleural fluid white cell count		HAEM	Silver topped or FBC			
PNH screen (by arrangement with Lab only)	4ml	HAEM	Purple	By arrangement with lab only	Within 24 hrs	
PO4 (Phosphate and is normally part of Bone profile)	mmol/l	CC	Gold	Part of Bone profile	up to 4 hrs	
Porphyria screen		CC	Purple + MSU + Faeces	Protect from light- give FULL clinical details. If '?' Acute		Local Screen and Cardiff Porphyria

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				Porphyria, take urine when symptomatic		Lab
Pregnancy test (urine)		CC	Plain	Early morning urine	24h	
Procollagen Peptide Type 3 (PIIINP)		CC	Green or red (no gel)	Separated within 3-4 hours of collection, Dermatology request only	up to 28 days	Southampton
Progesterone	nmol/l	CC	Gold	7 days prior onset of menses	up to 4 hrs	
Prolactin	miu/l	CC	Gold		up to 4 hrs	
Prostate specific antigen (PSA)	ug/l	CC	Gold		up to 4 hrs	
Protein C (functional)	3ml	HAEM	Blue	Part of thrombophilia screen		
Protein Electrophoresis		HAEM	Gold	Stable for up to four days if refrigerated.	24h	
Protein S	3ml	HAEM	Blue	Part of thrombophilia screen		
Prothrombin mutation	3ml	HAEM	Blue	Part of thrombophilia screen. Tube to remain unopened as molecular test	3 wks	Derriford
PTH (Parathyroid Hormone)	umol/l	CC	Gold	Must be processed within 4 hours	up to 4 hrs	
PTH related Protein (or Peptide)		CC	Special	Contact lab		
Puerperal Fever		CMB	Charcoal swabs Blood cultures Urines	Nose, throat & HVS	2 days	
Pyrexia of Unknown Origin		CMB	Blood culture set Charcoal swab Boric acid Fecon Gold	Blood cultures (min 2) Throat swab Urine Faeces Clotted blood acute & convalescent	2 days 1 day (neg) 1 day (neg) 3 days (neg) 7 days	

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Pyruvate Kinase (PK) screen	4ml	HAEM	Purple		1 week	
Quantiferon testing (TB)		CMB	Quantiferon kit	Discuss with Laboratory. Not available Friday to Sunday.		Exeter
Q-Fever (Coxiella Infections)		CMB	Gold	See 'Atypical Respiratory serology'. Please indicate if endocarditis/chronic infection suspected	7 days	Exeter/Bristol PHE
Rabies		CMB		**DO NOT send samples before discussing with Consultant Medical Microbiologist**		
Rast and IgE	7ml*	HAEM	Gold	Must list likely allergens *(for up to 6 allergens)	11 - 21 days	
Renin	1 mL	CC	Purple	Must be taken to Clin Chem immediately. If aldosterone ratio required Refer to Aldosterone for drug requirements	up to 28 days	Southampton
Reptilase time	3ml	HAEM	Blue		2 hrs	
Retics / Reticulocytes	4ml	HAEM	Purple	Sample stable for up to 48 hours	24h	
Rh antibodies	6m	BT	Pink	Must be handwritten with patient's forename, surname, DoB, gender, unique identifier (NHS or CR number), date & time of sample, and sample taker's signature	24 hr	
Rheumatoid factor	5-10ml	CC	Gold		up to 4 hrs	
Rickettsia	5-10ml	CMB	Gold	Give clinical details/travel/exposure history	10 days	PHE Porton Down

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Rivotril (Clonazepam)		CC	Gold, Green, Purple		up to 28 days	NSE
Ross River	5-10ml	CMB	Gold		10 days	PHE Porton Down
Rotavirus		CMB	Fecon container	Paediatric patients <5yrs (outbreaks and other groups after discussion with Laboratory)	24 hrs	
RSV (Respiratory syncitial virus)		CMB	Respiratory secretions (NPA preferred)	Monday to Friday tested by PCR Weekends immunochromatographic strips	<24 hrs	
Rubella Antibody studies (German measles)	5-10ml	CMB	Gold	Indicate whether immunity screen or diagnostic test is required	3 days	
SS	4ml	HAEM	Purple		48 hrs	
Schistosomiasis		CMB	Urine – steril container (non-boric). Faeces – Fecon container Serum - Gold	If infection suspected send 3 x faecal sample and 3 x terminal urine samples. Schistome serology may be helpful – discuss with laboratory.	24 hours 2 weeks	Serology – The Hospital for Trpical Diseases
Schuum's test	4ml	HAEM	Purple	Discuss with Consultant Haematologist		
Selenium		CC	Gold		up to 28 days	Sheffield
Sickle cell test / Sickle screen	4ml	HAEM	Purple		24h	
Sirolimus		CC	Purple	Trough sample	up to 7 days	Royal Brompton, Harefield
Skin antibodies	2ml	HAEM	Gold			Derriford
Solvent screen plasma		CC	Green		up to 28 days	London Toxicology

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Somatostatin	3 mL	CC	EDTA	EDTA on ICE. Part of Gut hormone profile	up to 28 days	Hammersmith
Sputum		CMB	Universal or 60ml sterile container	Saliva & postnasal secretions not suitable. Specimens taken before antimicrobial treatment is started. Indicate if CF or Ciliary Dyskinesis, Note if atypical infection suspected	3 days	
Sterile fluids (Includes joint, pleural, aminiotic and ascetic)	As much as possible	CMB	Sterile silver pot or white universal container	If urgent please phone. For crystals, specimen to be referred to Cytology **directly** or include a cytology form if small amount of specimen.	Gram film – day of receipt or 1hr if urgent. Culture 48hrs	
Streptococcus pneumoniae antigen		CMB	Sterile urine container	NOT boric	<24 hrs	
Sucroselyn		HAEM	Pink x 1 Red x 1			
Sulhonylureas		CC	Red (or plain urine)		up to 28 days	Guildford, Surrey
Surface Immunoglobulins		HAEM	Purple x 4	Haem Consultant request only	Within 24 hrs	
Surface markers (acute Leukaemia)		HAEM	EDTA x 4	Haem Consultant request only	Within 24 hrs	
Surface markers (chronic leukaemia)		HAEM	EDTA x 4	Haem Consultant request only	Within 24 hrs	
Swabs (various)		CMB	Charcoal swabs	Soak swab well in the deepest part of wound. Deep seated wounds, abscesses and urgent requests will also get a gram stain. (Link	3 days Gram stain – 1hr of receipt if urgent otherwise day	

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				to further Info)	of receipt	
Synovial fluid white cell count		HAEM	Sterile container			
Syphilis Antibody studies	5-10ml	CMB	Gold		4 days	
T Cell count CD4 (HAEM or GU Consultant only)		HAEM	EDTA	Haem or GU Consultant request only	Within 24 hrs	
T cell subsets		HAEM	Purple	Haematology and GU Consultant request only	Within 24 hrs	
T4 (Free T4/fT4)	5-10ml	CC	Gold	TSH is front line, with fT4 added if outside limits or <17yrs old	up to 4 hrs	
Tacrolimus (FK506) - Adult		CC	Purple	Trough sample (refrigerate asap)	up to 14 days	Derriford
Tacrolimus - Paediatrics		CC	Purple	Trough sample (refrigerate asap)	Up to 14 days	BRI
Tau protein (name no longer used) – please see Beta -2-Transferrin						
T Cell gene rearrangement (PCR)		HAEM	Purple x 4	Consultatant Haematologist request only		
TCK (creatine kinase)	5-10ml	CC	Gold		up to 4 hrs	
Tegretol (same as Carbamazepine)	5-10ml	CC	Gold		up to 4 hrs	
Teicoplanin	5-10ml	CC	Gold	Trough sample	up to 28 days	Microbiology, Southmead
Testosterone	5-10ml	CC	Gold	Preferably 9 am	up to 4 hrs	
Theophylline	5-10ml	CC	Gold		up to 4 hrs	
Thiopurine methyl transferase (TPMT)		CC	Purple	Done prior to starting Azathiopurine	up to 28 days	City Hospital, B'ham
Thiopurine metabolites (6-TGN		CC	Purple	Requested by Gastro team only		In hospital

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and 6-MMP)						
Thread worms		CMB	Plain perianal swab	Moistened and sent in saline	<1 day	
Throat swabs		CMB	Charcoal swab	Corynebacterium only if supported with certain risk factors (Link to further info - Throat swabs)	1 day Corynebact 3 days	
Thrombin Time	3ml	HAEM	Blue			
Thrombophilia screen	15ml	HAEM	Blue x 3, Gold x 1 + FBC	Send form to Coagulation. Discuss with Cons Haematologist	7 days	
Thyroglobulin (& antibodies)	5-10ml	CC	Gold	Ca Thyroid patients	up to 28 days	Derriford
Thyroid Function - initial test is TSH only	5-10ml	CC	Gold		up to 4 hrs	
Thyroid peroxidase antibodies	5-10ml	CC	Gold		weekly	
Tiagabine (Gagitril)	5-10ml	CC	Gold/Hep/EDTA	Trough sample	1 - 2 wks	NSE
TIBC (Transferrin and Iron)		CC	Gold	Request Iron Saturation	up to 4 hrs	
Tissue infection		CMB		Large enough to carry out all microscopical preparations and cultures	Single tissues 7 days Multiple tissues 14days	
Tissue Typing	4x4ml	HAEM	Purple x 4	Only by prior arrangement with the lab	11 - 21 days	
TnT (Troponin T)	5-10ml	CC	Gold		4 h	
Tobramycin / Amikacin etc	mg/l	CC	Gold	Sample must be trough in once daily regime	up to 4 hrs	
Toxocariasis	5-10ml	CMB	Gold	Give exposure/clinical details	14 days	Hospital for Tropical Diseases, London

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Toxoplasma gondii serology	5-10ml	CMB	Gold	Indicate whether patient is pregnant or immunocompromised	5 days	Microbiology, Swansea
Transferrin Glycoforms (See CDT)						
Transferrin receptors (Soluble)		CC	Gold		up to 28 days	Kings
Transfusion reaction investigation	See form	BT	Pink, purple & yellow + implicated units (s)	Discuss with Blood Transfusion Dept who will supply a form	24 hours	
Trichomonas vaginalis		CMB	Charcoal swab in Trichomonas broth	Swab posterial fornix, including any apparent candidal plaques	2 days	
TSH	5-10ml	CC	Gold		up to 4 hrs	
TSH receptor antibodies	5-10ml	CC	Gold		up to 28 days	Glasgow
T subsets (FACS)		HAEM	EDTA	Haematology and GU Consultant request only	Within 24 hrs	
Tuberculosis (Sputum)		CMB	Sterile universal container	Direct film Liquid Culture Slope Culture Early morning sputum taken on three consecutive days	24h 6 weeks 8 weeks	
Tuberculosis (Urine)		CMB	250ml non-boric acid container	Early morning urine taken on three consecutive days	8 weeks	
U&E	5-10ml	CC	Gold	(Electrolytes = Sodium - Na , Potassium - K, Urea, Creatinine)	up to 4 hrs	
Unconjugated Bilirubin	5-10ml	CC	Gold	Extra part of Liver function	up to 4 hrs	
Urethral swab (Gonorrhoea)		CMB	Orange topped charcoal swab	Link to Further info	Interim report 48 hrs	

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Uric Acid - Urate	5-10ml	CC	Gold		up to 4 hrs	
Urine culture and sensitivity (+ flow cytometry)		CMB	30ml red topped (7ml for small volume) boric acid container	Specimen container MUST be filled to within 1cm of the fill line marked on the container to ensure correct concentration of boric acid/urine hyperlink Do not refridgerate	FC <24hrs Culture 2 days	
Urine Albumin		CC	60ml sterile container	Do not use Red capped pot	Up to 4 hrs	
Urinary Adrenaline, Dopamine, Noradrenaline etc (ie catecholamines)		CC	Overnight	Order bottle from Chemistry	Up to 5 working days	
Urinary Amino Acids		CC	Random	Freeze on day of collection	up to 28 days	Southmead
Urinary Amphetamine		CC	Random	Must be positive DOA screen	1-2 weeks	
Urinary Amylase		CC	Random	Plain urine container (not red topped)	24 hours	
Urinary Arsenic		CC	Random or 24 hour	Stop eating fish/shellfish 5 days prio collection	Up to 28 days	Guildford, Surrey
Urinary Buprenorphine screen		CC	Random	Discuss with Biochemist before sending	Up to 28 days	Penarth
Urinary Calcium and Phosphate – 24 hours		CC	24 hour	Order bottle from Chemistry	24 hours	
Urinary Calcium and Phosphate **Random**		CC	Random		up to 4 hours	
Urinary Cannabis		CC	Random		up to 28 days	Torbay
Urine C-Peptide		CC	Random – Boric acid red topped	Endocrinologist request only. Required special protocol.		Exeter

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Urinary Catecholamines		CC	Overnight	Order bottle from Chemistry	up to 5 working days	
Urinary Citrate		CC	24 hour	Order bottle from Chemistry Must be acidified	up to 28 days	
Urinary Copper		CC	24 hour	Order bottle from Chemistry .To investigate disorders of copper metabolism	up to 28 days	
Urinary Creatine		CC	24 hour	Order bottle from Chemistry	up to 5 working days	
Urinary Drugs of abuse		CC	Random	Amphetamine, benzodiazepine, cocaine, methadone, Opiates	up to 5 working days	
Urinary Electrolytes		CC	24 hour	Order bottle from Chemistry	24 hours	
Urinary Electrolytes **Random**		CC	Random		up to 4 hours	
Urinary Free Cortisol (UFC)		CC	24 hour	Order bottle from Chemistry	up to 5 working days	
Urinary Galactitol		CC	Random	Lab will freeze specimen upon receipt	Up to 28 days	
Urinary HVA/VMA		CC	Random	For monitoring of Neuroblastoma	Up to 28 days	BRI
Urinary Indole Acetic Acid (5-HIAA)		CC	24 hour	Order bottle from Chemistry	up to 5 working days	
Urinary Intestinal Permeability		CC	Two timed collections		1- 2 weeks	
Urinary Ketones		CC	Random	Dipsticks available on the wards	24 hours	
Urinary Magnesium		CC	24 hour	Order bottle from Chemistry	Up to 28 days	Derriford
Urinary Mercury		CC	Plain EMU		Up to 28 days	Guildford, Surrey
Urinary Microalbumin (initial screen) -		CC	Random		24 hours	

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**Which tube?** **Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
Urinary Mucopolysaccharides		CC	Random		up to 5 working days	Bristol
Urinary N-Methyl Histamine		CC	24 hour		Up to 28 days	
Urinary Organic acids		CC	Random	Freeze same day	Up to 28 days	Southmead
Urinary Osmolality		CC	Random	With a paired blood sample	Up to 4 hours	
Urinary Oxalate		CC	24 hour	Order bottle from Chemistry	Up to 28 days	UCL
Urinary pH		CC	Random		Up to 4 hours	
Urinary Porphyrin &/or Porphobilinogen (PBG)		CC	Random	Take sample during symptoms. Protect from light, send to lab asap. Give full clinical details	Up to 5 working days	Local PBG screen & Cardiff Pophyria Lab
Urinary Protein		CC	24 hour	Order bottle from Chemistry	24 hrs	
Urinary Protein / Creatinine ratio - **Random**		CC	Random		Up to 4 hours	
Urinary Reducing Substances		CC	Random		Up to 5 working days	
Urinary Retinol Binding protein / Creatinine ratio		CC	Random	Freeze same day	1-2 weeks	GOSH
Random Urinary Sodium		CC	Random		Up to 4 hours	
Urinary Steroids (Full profile)		CC	Plain 24 hour or for children plain random	Full steroid profile for Paediatric or complicated Endocrine cases only. Order bottle from Chemistry . If Cortisol only wanted- see Urinary Free Cortisol (UFC)	4 weeks	
Urinary Urate		CC	24 hour	Order bottle from Chemistry	24 hours	
Random Urinary Urate		CC	Random		up to 4 hrs	

Specimen, Test or Suspected infection (in alphabetical order)	Sample volume (n/a if blank)	Which Lab?	Which tube? Note – mix purple, pink or blue tubes asap to prevent clotting	Remarks	Turnaround Time	Referred for testing to (see Reference Facilities information for details)
Urinary Urea and Creatinine		CC	24 hour	Order bottle from Chemistry	24 hours	
Valproate (Sodium Valproate)	5-10ml	CC	Gold	Only measured in cased of suspected OD or non-compliance	up to 2 weeks	Torbay
Vancomycin	5-10ml	CC	Gold	Trough is immediately prior to next dose Peak = 1 hour after the end of infusion	up to 4 hrs	
Varicella Zoster diagnosis		CMB	UTM swab	Swab lesion for VZV PCR	5 days	PHE Bristol
Varicella Zoster immunity	5-10ml	CMB	Gold	Indicate whether patient is pregnant or immunocompromised. Give contact date where appropriate	2 days <24hours if urgent	
Vasectomy (post) screen		HAEM	Universal		4 days	
VIP (Vasoactive intestinal peptide)	3 mL	CC	EDTA	EDTA on ICE. Part of Gut hormone profile	up to 28 days	Hammersmith
Vasopressin		CC	EDTA	EDTA on ice. Part of Gut hormone profile	up to 28 days	
Very long chain fatty acids		CC	Purple/ Li Hep/ Paed clear top		up to 28 days	Southmead
Vibrio species		CMB	Fecon container	Clinical details essential: country and dates of travel (link to Further info)	3 days	
Vitamin A		CC	Gold		up to 14 days	Derriford
Vitamin D 25-OH Vitamin D		CC	Gold		up to 28 days	Derriford
Vitamin E		CC	Gold		up to 14 days	Derriford
Vitamin B12		CC	Gold		up to 4 hrs	

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**Which tube?** **Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
Voltage gate antibodies		HAEM	Gold			Oxford
VW Factor – VWF ag & activity	6ml	HAEM	2 x Blue	Send form and details to Coagulation	3 weeks	
VWF, VWF Collagen binding, VWF multimers	6ml	HAEM	2 x Blue	Send form & details to coagulation	2-4 wks	Oxford
White cell enzymes		CC	Purple	Receive sample in lab prior midday Mon to Thursday. Give full clinical details	up to 28 days	BRI
Whooping cough	5-10ml	CMB	Blue wire pernasal swab Gold – serum Nasopharyngeal aspirate	Sample anterior nares by rotating the swab on the surface Serology can be used diagnostically – discuss with Laboratory NPA is the “Gold Standard” sample	7 day	PHE Colindale
Worms (Roundworm/Hookworm)		CMB	Fecon container	Minimum 3 specimens of faeces on different days + whole worm or segment if available	1 day	
Worms (Liver fluke/ Trichuris/ Strongyloides)		CMB	Fecon container Gold	Min 3 specimens of faeces For strongyloides	5 days 5 days	Hosp for Tropical Diseases, London
X1 Assay		HAEM	Blue			
Yersinia		CMB	Fecon container	3 specimens , Yersinia must be requested specifically and clinical details given	2 days	

Specimen, Test or Suspected infection (in alphabetical order)	**Sample volume (n/a if blank)**	**Which Lab?**	**<u>Which tube?</u> Note – mix purple, pink or blue tubes asap to prevent clotting**	**Remarks**	**Turnaround Time**	**Referred for testing to** (see Reference Facilities information for details)
Zinc (Zn)	l	CC	Gold		up to 14 days	Derriford
Zinc protoporhyrin		CC	Purple	Not centrifuged	up to 28 days	Kings

APPENDIX 2. LABORATORY MEDICINE

1. Department of Clinical Chemistry

Service details

1.1. Routine Requests

Monday to Friday most biochemical investigations are completed and reported on the day of receipt. A limited service is available on Saturday mornings and Bank holidays. An out of hours' service for emergency cases operates at all other times.

1.2. Urgent requests

During normal laboratory hours
Contact a member of the laboratory staff on extension 2547 to arrange for the analysis to be performed urgently. **Requests for urgent tests cannot be handled on other telephone lines.** Writing "urgent" on the request form will not guarantee that the specimen will be handled as an emergency.

Outside normal laboratory hours, including Sundays
The service operates for **EMERGENCY** requests only. The on-call BMS must be contacted through the Hospital switchboard.
Results breaching our phone limits for urgent tests will be telephoned to the ward when they are available.

Out of hours test repertoire:

- Electrolytes, Creatinine, Urea,
- CRP
- LFTs
- Serum and Urine Osmolality
- Calcium
- Blood gases and acid base status
- Glucose
- CSF Protein and Glucose
- Amylase
- Salicylate
- Paracetamol
- Magnesium
- Ethanol
- TnT
- HCG (from Obs and Gynae)
- CSF Xanthachromia 10 :00 – 15:00 Sat Sun

Requests for other tests outside laboratory working hours must be made to the Consultant on-call for Clinical Chemistry.

1.3. Results by Telephone

The phoning policy does not replace the essential requirement for each clinician to be responsible for promptly accessing and acting on the result of every investigation they request, but is designed to provide a safety net for the highlighting of 'highly significant' findings i.e. those that fall outside the critical limits as defined by the laboratory. These limits have been developed following guidance issued issued by the Royal College of Pathologists (document number G025, Nov 2010).

Other results such as those of tumour markers and endocrine requests are reviewed by Clinical Biochemists and phoned at their discretion. Without knowing the full clinical picture or relevant clinical details, the significance of the results is often difficult to judge. The Clinical Biochemists use their clinical judgement and the information available, to decide whether to ring a result to the requesting physician but cannot guarantee, or be held responsible, for ringing all clinically significant results.

If results are requested by phone, it is important to **only** use extension **2540** or **2548.** Direct dial is available by prefixing these numbers with 01872 25.

1.4. Clinical Liaison and Test Protocols

Specialised tests including dynamic test procedures require the specimens to be collected in the correct manner. Test protocols for most diagnostic procedures are obtainable from the laboratory. The Clincial biochemists are available for discussion on the choice of tests and the interpretation of results. For specialist clinical advice contact the Consultant Chemical Pathologist.

Some tests require special analysis which is only available at reference laboratories. Many of these analytes are unstable and it is vital that specimens be collected in the appropriate manner. Such tests should always be arranged in advance with the laboratory to avoid the unnecessary repetition of invasive procedures.

If the services of the department are required in a research project or a drug trial it is essential that the protocol is discussed with the head of department, Dr SC Fleming, before the project is started.

1.5. Urine specimen requirements and preservatives

Please Note: some of the preservatives used are hazardous. Please ensure patients adhere to the instructions on collection bottles. Adding specimens directly to containers is not acceptable.

Analyte		Bottle type		Preservative
Calcium		24 hour		20 ml 5M Hydrochloric Acid
Phosphate		24 hour		20 ml M Hydrochloric Acid
Oxalate or Citrate or Cystine		24 hour		20 ml 5M Hydrochloric Acid
5-HIAA		24 hour		20 ml 5M Hydrochloric Acid
Full Steroid profile		24 hour		Plain
Electrolytes		24 hour or random		10 ml Thymol in Isopropanol
Creatinine		24 hour or random		10 ml Thymol in Isopropanol
Urea		24 hour or random		10 ml Thymol in Isopropanol
Protein		24 hour or random		10 ml Thymol in Isopropanol
Catecholamines		Overnight		2g EDTA / Metabisulphite
Metanephrines		24 hour		20 ml 2M Hydrochloric Acid
Urate		24 hour		10 ml 6M NaOH
Urinary free Cortisol		24 hour		Plain
Albumin Creatinine ratio		Overnight		Nil

1.6. Specimen collection and storage

Delay in separation of the cells from the serum can lead to inaccuracies in the results. The date and time the specimen was taken must be clearly recorded on the tube and the request form. If sample transport considerations mean the transit time from venepuncture to receipt in the laboratory is great than 4 hours, the surgery should consider obtaining a centrifuge and spinning them locally. Unspun blood tubes for chemistry requests should never be stored in the fridge. Once spun, the samples can be safely stored in a refrigerator for up to 48 hours.

Angle head centrifuges are not idea and may produce poor quality separation resulting in rejection of the sample.

To obtain advice and information on suitable centrifuges or on any aspect of centrifuging samples contact**:** Alan Bromley, Lead BMS, Clinical Chemistry Tel 01872 25 2542

1.7. Retrospective testing

Specimens are retained in Clinical Chemistry under appropriate storage for up to 3 days. It is possible to ask for tests to be added to samples already received provided the analyte required is sufficiently stable. It may not be possible to add certain tests which are known to deteriorate after a short time e.g. Troponin may only be added within 24 hours of obtaining the sample.

If further tests are required, please telephone the laboratory to make the request and seek advice on lability. Within RCH please send a request form according to the 'Add on' protocol.

1.8. Blood / Plasma Glucose

Specimens for GLUCOSE from primary care should always be placed in special tubes containing Fluoride / EDTA. Glucose samples must be inverted 8-10 times to mix the preservative and blood. It is important to ensure that the glucose tube is adequately filled as shown on the tube guide.

Please note - When sampling into a range of different tubes; follow the order shown on the tube guide. This avoids contamination of tubes with anticoagulants which may interfere with subsequent samples.

For some tests. If in doubt please contact the laboratory

1.9. Test profiles

Please note: Multiple tests may require several specimen tubes.

1.9.1. **Electrolytes –**
The routine profile for electrolytes:

Primary Care: Sodium, Potassium, Creatinine.
Urea must be requested separately

In-patients: Sodium, Potassium urea and Creatinine.

Chloride and Bicarbonate are available but need to be specifically requested.

1.9.2. **Liver** - This group routinely includes Total Protein, Albumin, Globulins, Alanine Amino Transferase (ALT), Alkaline Phosphatase (ALP) and Total Bilirubin. Conjugated Bilirubin and Alkaline Phosphatase isoenzymes can be requested separately.

1.9.3. **Bone** - Tests included are Total Protein, Albumin, Calcium, corrected Calcium, Phosphate and ALP. Ionised Calcium is available on

request to hospital patients and requires an additional tube (Gold) (as full as possible)

1.9.4. **Urate** - Requests for serum Urate will be automatically coupled with a measure of Creatinine since so many cases of hyperuricaemia are due to a degree of renal dysfunction.

1.9.5. **Lipids** - An initial screen can be performed by using a random total Cholesterol or Lipid profile. Tests in the Lipid profile are Cholesterol, Triglyceride and HDL-Cholesterol and calculated LDL cholesterol

Patients with combined hyperlipidaemia should be monitored using a fasting profile. Further guidelines on the management of hyperlipidaemia can be obtained from Dr. Fleming.

1.9.6. **Drugs of abuse** - Full screens on new patients require 50 ml of urine to perform the following tests:

- Amphetamines, Opiates, Methadone and Benzodiazepines and cocaine.

- Cannabinoids should be requested additionally to "Drugs Screen" if required and these are referred to another laboratory for analysis.

Under no circumstances should this screen be used for medico legal or employment screening.

1.9.7. **Haemoglobin A1c** – is used for monitoring glycaemic control and for the diagnosis of Diabetes Mellitis in adults.

1.9.8. **Thyroid Function Tests** - the front-line Thyroid function test analysed is a measurement of TSH. Generally the result is within the reference range, no further tests are performed. There are a number of exceptions; if the patient is <17 years old, pregnant or under endocrinology or oncology. Further tests (Free T4 & Free T3) are added to assist in diagnosis and monitoring as appropriate. Therefore full clinical details and the dose(s) of any treatment employed are essential.

1.9.9. **Therapeutic drug monitoring** - Drug levels are only useful after the patient has been on the therapy for sufficient time to achieve steady state conditions and samples must be taken at appropriate times. See table below.

DRUG	AKA	SAMPLE TYPE	TIME OF SAMPLING	THERAPEUTIC RANGE	UNIITS
CARBEMAZEPINE	TEGRETOL	SERUM HEPARIN	TROUGH PRE DOSE	4 to 12	mg/L
PHENOBARBITAL		SERUM HEPARIN	TROUGH PRE-DOSE	10 to 40	mg/L
PHENYTOIN	EPANUTIN	SERUM HEPARIN	TROUGH PRE-DOSE	10 to 20	mg/L
SODIUM VALPROATE	EPILIM	SERUM HEPARIN	TROUGH PRE-DOSE	REFERRED ANALYSIS	
THEOPHYLLINE	AMINOPHYLLINE	SERUM HEPARIN	PEAK 2 HOURS 6-8 HOURS FOR SLOW RELEASE	10 TO 20	mg/L
DIGOXIN		SERUM HEPARIN	6-8 HOURS POST DOSE	0.5 to 2.0	ug/L
LITHIUM	PRIADEL CAMCOLIT	SERUM	12 HOURS POST DOSE	0.4 TO 1.0	mmol/L
PARACETAMOL	ACETAMINOPHEN	SERUM HEPARIN	>4 HOURS POST INGESTION		mg/L
SALICYLATE	ASPIRIN	SERUM HEPARIN	If raised ?bolus check 2nd sample		mg/L

1.9.10. AntibioticTesting

Vancomycin, Gentamicin and Tobramycin are measured in Clinical Chemistry at RCH and other antibiotics are referred to Southmead Hospital Bristol.

Vancomycin and **Gentamicin** analyses are available daily, with a turnaround time of approximately 2 hours during normal working hours (Monday to Friday) and within 4 hours on weekends and Bank Holidays.

Tobramycin analyses are also performed on-site. This is test is performed on demand.

All other antibiotic requests will be referred to Southmead Hospital for analysis.

It is important that the guidelines found in the Antibiotic Policy, and on the Intranet, are followed with regard to dosing and sampling times.

1.10. Down's Syndrome (DS) Screening Service

1.10.1. DS Screening First Trimester Combined Test

All pregnant women booking before 12 weeks are offered screening in the first trimester of pregnancy using the **'Combined' test** - this involves nuchal translucency (NT) measurement (fluid present in all fetuses at the back of the neck) at the time of the dating scan and blood taken for free β-hCG and PAPP-A measurement.

Written information is sent to women in advance of the booking appointment. The booking midwife requests an early dating scan. At the Early Dating Scan appointment the patient is asked if she wants to have the blood test for DS screening. If she does, she is scanned and the NT measurement is taken (N.B. women not requiring DS screening just have the early dating scan). The woman then has blood taken (1x SST buff top tube) by the phlebotomist and is weighed. The test is performed between 11+2 and 14+1 weeks' gestation.

The phlebotomist puts a barcode label on the sample and all the information (including smoking status and ethnicity) is entered into the Viewpoint fetal medicine system and the request exported to the Kryptor analyser in the Clinical Chemistry department. Batches of samples are delivered to the laboratory for analysis. Following analysis the results are imported back to Viewpoint by a Clinical Scientist and the risk calculated. Risks are usually available within one working day of the samples being received in the laboratory.

All lower risk results are reported to the women via a letter sent from the Clinical Chemistry department and should have been received within 7 days.

All higher risk results are phoned and faxed to the Screening Coordinator or her deputy – the woman is then contacted and offered a counselling appointment, followed by CVS (chorionic villus sampling) or amniocentesis if required. The results are reported on Viewpoint and WinPath.

The test achieves a Down's syndrome detection rate (DR) of >75% with a <3% screen positive rate (SPR) using a **cut off risk of 1 in 150 at term**, as required by the National Screening Committee (NSC) current working standards.

1.10.2. DS Screening Second Trimester Quadruple test

The quadruple test is for all those women booking too late for the new first trimester combined test, i.e. cannot have a nuchal translucency (NT) scan by 14+1 weeks.

The quad test measures AFP, free β-hCG, unconjugated oestriol and inhibin-A (as explained in the Wolfson Institute leaflet). Unconjugated oestriol is unstable in whole blood and free β-hCG is more unstable than total hCG (which we used to measure) - **samples** therefore **need to be**

received by our laboratory **within 24 hours** of being taken to be spun and separated. **Samples must not be taken on a Friday if they cannot be sent to the RCHT lab on the courier on the same day.**

One **full** buff top tube is required, as 1ml of serum needs to be sent away and a sample is also kept here in case the first gets lost in the post.

Samples should be taken between 14+2 and 20+0 weeks. The Newcastle Royal Infirmary request form should be **fully completed** (including maternal weight at sampling, ethnicity and smoking status, as all affect the DS risk). If the woman has not had a scan please provide the date of future scan, if known.

Return both the sample and form to the Clinical Chemistry **(No other form should be used** – please contact the laboratory and a form will be forwarded to the appropriate ward/department, if necessary). Batches of quad forms are available from Clinical Chemistry on request or an electronic version is available – please contact Dr Angela Mallard or Miss Anna Barton for details.

Samples are spun and separated on receipt and referred to the Newcastle Royal Infirmary on Mondays to Thursdays. Samples received on a Thursday to Saturday are stored separated and frozen over the weekend and posted the next working day.

Lower and higher risk results are reported in the same way as for the FT Combined service, outlined above. Higher risk results are faxed to our laboratory by the Newcastle Royal Infirmary, usually within two days, whereas Lower risk results are posted, with an average turn around time of 10 days. Results of all Quad tests can be viewed on Viewpoint and WinPath.

This test achieves a Down's syndrome detection rate (DR) of 75% with a 3.3% screen positive rate (SPR) using a **cut off risk of 1 in 150 at term**.

> **Although this doesn't comply with the current NSC requirements, it is the best test possible for late bookers or women who cannot have an NT measurement performed.**

1.10.3. NTD service

The NTD service in Cornwall is now provided via the anomaly scan at around 20 weeks. No samples will be referred for NTD screening.

If you have any queries, please contact either: -

- Dr. Angela Mallard (01872 252564) or
- Miss Anna Barton (01872 252566)

2. Department of Haematology

Service Details

2.1. For urgent requests tick the box on form. Please phone the laboratory if results are needed immediately or for blood products that are needed urgently.

Out of hours, do not bleep the BMS unless very urgent or for a cross match/blood product issue, or advice.

Tests available outside normal laboratory hours are:

- FBC + film in exceptional cases (eg Malaria), ESR, IM Screen, Sickle Screen, Retics
- Basic Coagulation screen (reason for D-Dimer must be stated - ?DVT.PE & ?DIC)
- Group & screen, Crossmatch and blood product/component issue

Additional tests (eg Factor VIII assay) available by arrangement

A few tests are only available by agreement with a Consultant (e.g. cell markers). Available tests are listed in the Pathology repertoire table with additional advice.

2.2. Reporting /Telephoning

Results which are markedly abnormal will always be telephoned. Most standard GP test results are available on the next working day. Certain tests are done in weekly batches and others are referred to other centres and will therefore take longer to report (see Pathology repertoire table).

Inpatient results for standard tests (e.g. FBC & Coagulation) will usually be available within two hours of laboratory receipt.

INR results are reported to GPs via GP link by 1830 on the day of receipt provided the request is received by 1630.

As a safeguard all INRs over 5 are automatically telephoned and verbally communicated by laboratory staff to the relevant surgery or Serco (Kernow Urgent Care Services) as appropriate. Telephone requests for results should be avoided whenever possible. Surgeries are asked to check their IT systems before telephoning the lab.

Where an urgent telephone request for an essential individual result is received from a source without computer access to results, the INR will be communicated

on the basis of patient ID using three points of reference (Name, Date of Birth, Address) after verification of the patient's NHS number.

Telephone requests for multiple results will be advised to await transmission of results by GP link as the risk of a transcription error is raised. A delay in notification to the patient in most cases of 1 – 2 days is satisfactory (BCSH guidelines)

We appreciate that there may be a need to telephone for results but would ask that this is kept to a minimum using the Pathology Joint Reception number (01872 25) 2548 or 2540.

Please try to telephone in the morning whenever possible.

2.3. Retrospective testing

Samples are retained in the Haematology laboratory under appropriate storage. It is possible to ask for tests to be added to samples already received, provided the additional analyte is sufficiently stable. This may be done by telephoning the laboratory. Refer to the Pathology repertoire table for specimen requirements.

2.4. Semen Analysis

The Coagulation laboratory provides the semen testing service in Cornwall

2.5. Male Fertility Investigation

This includes volume, pH, motility, viability and normality assessments, count, a direct antibody screen and identification of any cells in a sample closely following WHO guidelines. A basic interpretation of the results is available from the scientific staff. Due to the significant variation in individual's sperm parameters a second confirmatory testing is recommended following the observation of an abnormal result.

The Male fertility investigation may only be undertaken **by prior arrangement with the laboratory** due to the logistics of having to test samples immediately. Please send a completed pathology request form to the laboratory (instructions on rear). The patient's full address must be noted so that we can send the appointment, container & instructions. Due to the laboratories other commitments, testing is usually limited to set periods within a week, but if there are particular time requirements please discuss with the laboratory.

Samples are collected by masturbation following at least two days of abstinence. Production at the patients' home and delivery to the laboratory within 1½ hours for testing is usually satisfactory.

Full instructions are included in the appointment letter sent to patients.

If there are particular problems regarding sample production a room can be used in the Cornwall Centre for Reproduction Medicine on Wheal Unity ward by prior arrangement only.

Due to the distance special arrangements exist for patients in the West of the county if sample transport is required.

2.6. Post-vasectomy screening - specimens may be sent to the laboratory without prior arrangement via the courier service.

The British Andrology Society recommends that patients should be instructed to ensure that they have had at least 24 ejaculations, and preferably wait at least 16 weeks before submitting a first semen sample for examination. This will reduce the number of false positive samples and thus minimise both patient inconvenience and repeat laboratory assessment. Patients should be given a further collection container and instructed to produce a second ejaculate for examination at an interval of two to four weeks after the initial assessment. A patient is usually considered clear after two following negative results.

Reference: British Andrology Society Guidelines for the assessment of post vasectomy semen samples (2002). J Clin Pathol., 55, p812-816.

Results will be reported as positive (sperm seen) or negative.
We have been advised that qualitative assessments of spermatozoa should not be used as they are not based on published data. However, a comment will still highlight if normal numbers or any motile ones are present.

2.7. Coagulation Screening

Appropriate requesting of Coagulation screening includes:

- Monitoring coagulopathy associated with massive blood transfusion
- Investigation of DIC
- Haematemesis (significant)
- Liver disease
- Patients having renal and liver biopsies and ERCP
- Investigation of a patient with a significant history of bleeding/bruising
- When there is a significant family history of a congenital bleeding disorder
- If D-dimer is required please state reason ?DVT/?PE/?DIC

2.8. Specimen requirements for coagulation studies

Test	Sample	Storage	Ref ranges
PT/INR (warfarin)	1 citrate	Stable for 24hrs at 4°C	
APTT (Heparin)	1 citrate	4 hours	1.5 – 2.5 (ratio)
Clotting screen	1 citrate	4 hours	0.8 – 1.2 (ratio)
D-dimer for DVT/PE/DIC	1 citrate	4 hours	Negative
Factor assays	1 citrate	4 hours	

2.9. Coagulation tests: pre-analytical variables

Variable	Affect on result
Sample type	Trisodium citrate precipitates calcium therefore stopping clot formation: other anticoagulants cannot be used due to different mechanisms of action
Sample volume*	Blood: anticoagulant = 9:1. Underfilling/overfilling will affect this ratio.
Sample production	Clean venepuncture and gentle mixing needed to avoid blood frothing and activation of coagulation.
Sample age	PT stable for 24 hours; APTT ideally tested within 4 hours of sampling.
Sample clotted/ activated	Activation may result in shortened time.
Haemolysis	Excessive haemolysis may result in shortened time; interferes with chromogenic/immunological measurement.
Jaundice/lipaemic	Interfere with automated clot detection; interfere with chromogenic/immunological measurement.

* Coagulation samples are volume critical, if a patient is difficult to bleed paediatric tubes (1.3ml) are available on request.
Some patients with a grossly raised Haematocrit (HCT) >0.57 may give errorneous coagulation test results – individual patient adjusted volume coagulation tubes are available on request from the laboratory.

2.10. Thrombophilia

The current NICE guidance on thrombophilia investigation strongly recommends against blind testing. Where a familial thrombophilia anomaly has been identified, screening may be undertaken, though it may not alter that individual's management with respect to at risk situations. Generally, patients with an inherent tendency to thrombosis present by 50 years of age, accepted clinical reasons:

- Recurrent unexplained thrombosis
- Spontaneous thrombosis before 45 years of age
- Thrombosis at atypical sites such as axillary, cerebral or mesenteric veins
- Arterial disease before 30 years of age
- Skin necrosis with the use of warfarin
- Family history of thrombophilia (first degree relative)
- Relatives of patients with thrombophilic abnormalities
- Women considering the oral contraceptive pill, or hormone replacement therapy with a family history of thrombosis (first degree relative)
- Repeated foetal loss/IUD

Thrombosis Prevention Investigation And Management Of Anticoagulation Guidance

Thrombophilia screening should start with an affected relative. Current guidelines advise screening other family members only if a defect is identified in a first degree relative.

Thrombophilia screening should be performed when a patient is stable (unless clinically urgent), even if on Warfarin, as results can be unsatisfactory if performed close to an event, due to the acute phase response.

Investigation at the time of thrombosis may be invalidated by the acute phase reaction and also anticoagulants. Rarely does this information affect acute management, but if essential, screening can be done after 2-3 months, even on warfarin.

Completion and submission of a Thrombophilia Investigation Sheet and sent with accompanying samples will speed appropriate testing and return of results – please contact lab directly on 01872 25 (2502) if a copy is required.

All thrombophilia results outside normal ranges are referred to Consultant Haematologist for review.

2.11. Screening for Lupus Anticoagulant

Current guidance recommends testing for lupus anticoagulant only in patients:

- Vascular thrombosis (arterial thrombosis, venous thrombosis or vasculitis)
- Unexplained pregnancy morbidity
- Investigation of raised APTT

Thrombosis Prevention Investigation And Management Of Anticoagulation Guidance

2.12. Anticoagulant Control
Most routine anticoagulant care is undertaken by general practitioners.

There is a medically supervised anticoagulant clinic operating from 0900 hrs to 1130 hrs each Wednesday, which is run by the DVT clinic (01872 253597). Complex cases or patients whose anticoagulant care is difficult to control may be overseen by Dr Creagh, arrangements made by telephone (ext. 2501/2506/2524) or by writing or faxing his secretary (fax on 01872 253237).

Thereafter follow-up anticoagulant control is generally offered via a postal service (INRStar computerised dosing system for warfarin treated patients or the "DOH Gold card scheme" for non-warfarin treated patients). The INR sample is obtained by the surgery and sent in with the INRStar dosing sheet or the DOH Gold Anticoagulant Therapy Record. Adjustments to dosage are made and the new INRStar dosing sheet or Gold card returned directly to the patient. Please note that for samples on Friday the patient may only receive the returned dose schedule on the following Tuesday.

Those surgeries wishing to undertake performing their own INRs should contact the coagulation laboratory who will be pleased to offer an INR Point of Care advisory and monitoring service.

Therapeutic ranges for anticoagulation BCSH Guidelines on oral anticoagulation (warfarin): third edition – 2005 update

2.13. Advice on Results For medical opinion on results or advice on patient management, it is usually possible to speak to one of the Consultant Haematologists during working hours via the medical secretaries. For urgent consultation out of hours please contact the switchboard.

2.14. **Outpatient Referrals** Please write directly to the consultant for new outpatient appointments.

Waiting times are generally short (1-4 weeks). Urgent cases will be seen earlier by prior arrangement with a Consultant Haematologist.

2.15. Reference ranges
Reference ranges (age and sex related where appropriate) are included in reports. Results, which exceed these ranges, are emboldened. Ranges for some common tests are given below. Information on reference ranges is given in Appendix 6.

2.16. Transfusion
All patients requiring transfusion in the Haematology out-patient department should be referred through a consultant Haematologist with full documentation of medical and drug histories. The patient will only be seen by the Haematologists if this is requested within the referral. Any patient who is bed-

bound or unable to attend to their own toileting should be referred as an in-patient.

Samples for group & save/crossmatch are valid for a maximum of 7 days; however, this is affected by the patient's transfusion and obstetric history. Regularly transfused patients may need samples taken more frequently - please contact the laboratory on extn 2500 if you are unsure. Advice is also available on the reverse of the request form.

Antenatal testing: Screening should test all mothers twice in pregnancy, at booking and a second time in the 28th week of gestation for ABO and Rh (D) groups and antibody screening. If any further testing is required as a result of these tests, a report will be issued suggesting appropriate follow-up tests and their timing.

All Rh (D) negative mothers, who do not have immune anti-D, should be offered anti-D prophylaxis. This is an essential part of the management of Rh (D) negative women. A standard dose of 1500iu should be administered at 28 weeks gestation **after** the samples for the routine screen have been taken and after any potentially sensitising event.

Wherever possible, the cause of anaemia should be investigated and where a reversible cause is identified, this should be corrected before resorting to transfusion

2.17. RCHT Maximum Surgical Blood Ordering Schedule (MSBOS)

The MSBOS is a guide to help ensure that blood is available at elective surgery.

This guidance is not absolute and factors other than the type of surgery (e.g. low Hb, antiplatelet drugs, bleeding tendency, previous surgery, co-morbidities etc.) should be considered with respect to both the choice of hospital site and the availability of cross-match.

LINK TO MSBOS ON DOCS LIBRARY (CURRENTLY BEING AUTHORISED / UPLOADED)

2.18. Blood film examination

A blood film is examined either if specially requested with appropriate clinical details or if the full blood count results are significantly abnormal and film examination is likely to further refine the diagnosis. For this reason, the inclusion of clear and accurate clinical information on the request form is very important.

Important clinical features to include are:

- Evidence of anaemia or jaundice
- Evidence of lymphoproliferative or myeloproliferative disease, especially splenomegaly or lymphadenopathy.

- Evidence of haemoglobinopathy.
- Evidence of thrombocytopenia.
- Suspicion of disseminated intravascular coagulation
- Acute renal failure
- Retinal haemorrhage or evidence of hyperviscosity.
- Bacterial, viral or parasitic infection
- Disseminated cancer

The decision to look at a blood film is dependent on age, sex, any relevant medical history, previous FBC results or if a previous blood film has been reviewed. If there is a clinical need for blood film review, alert the laboratory by clearly stating the reason on the request form. In the event of a request for blood film review arising after FBC analysis, contact the laboratory directly up to 24hours after the sample was taken and it will be added to the request. After this a fresh sample is required. Correct storage of the sample prior to delivery to the laboratory is important, as blood cells will start to deteriorate in just a few hours if exposed to heat. Further tests are sometimes indicated as a result of blood film review. Where possible the laboratory will instigate these directly, otherwise advice for further testing may be included in the report. To aid in interpretation a list of the more common technical terms used in the blood film report is included, with explanation of the term and the most common causes.

2.19. Morphological description terms

2.19.1. Red cell morphology

Acanthocytes: Red cells with a smaller number of irregular spicules. Acanthocytosis may be inherited, but is more commonly seen in liver disease, myelodysplasia and post splenectomy.

Anisocytosis: Increase in the variability of red cell size. A non-specific abnormality found in many, haematological abnormalities, suggestive of altered haematopoiesis.

Auto-agglutination. Red cells that are sticking together because of antibodies. When reported on a blood film, this normally refers to cold antibodies and is an in-vitro effect. Often seen in Cold Haemagglutinin disease.

Dimorphic: Two distinct populations of red cells. Most often seen when a haematological abnormality has been corrected as in the successful treatment of iron deficiency, when a new population of normochromic normocytic cells will exist alongside the older hypochromic microcytic population.

Basophilic Stippling: Red cell inclusions that contain RNA. Generally seen in dyserythropoiesis and haemoglobinopathies.

Echinocytes: Red cells covered in short blunt spicules. Echinocytes are a reversible change in red cells. Most often occur as a result of storage of blood before a film is made. Other causes are liver disease, renal disease and haemolytic uraemic syndrome

Elliptocytes: Red cells that are elliptical instead of round. Hereditary elliptocytosis is a result of a defect in the red cell cytoskeleton. Smaller numbers may be seen in iron deficiency, megaloblastic anaemia, myelodysplasia and myelofibrosis. Less elliptical cells are sometimes called ovalocytes. Long thin cells are called pencil cells and are typically associated with iron deficiency.

Howell-Jolly bodies: Fragments of nucleus remaining in a red cell. These are a normal feature that should be removed by the spleen. An excess is therefore seen post splenectomy and in hyposplenic states. They can also be seen in patients receiving antimetabolite therapy (e.g. Methotrexate) or megaloblastosis.

Hypochromia: A red cell that is pale in colour. Can be caused by any of the conditions that cause microcytosis. Often reported together. Iron deficiency is a hypochromic microcytic anaemia. Can also be present in anaemia of chronic disorders

Macrocytosis: Increase in red cell size. An increase in the size of all of the red cells will cause a rise in MCV, but some macrocytes can be present in the absence of a raised MCV. Will be present in liver disease, some tumours, as a result of chronic excessive ethanol consumption, B12 or folate deficiency, myelodysplastic syndrome and other marrow disorders such as myeloma, antifolate drugs (e.g. methotrexate) or those that interfere with DNA metabolism (e.g. azathioprine). Reticulocytes are larger than mature red cells, so can raise the MCV if present in exceptional numbers. Oval macrocytes are characteristic of megaloblastic anaemia.

Microcytosis: Decrease in red cell size. Most often seen in iron deficiency and the anaemia of chronic disease. More rarely in the haemoglobinopathies and thalassaemia

Normochromic: A red cell that is normal in colour and therefore contains a normal concentration of haemoglobin. Red cells with normal appearance are present in the absence of a haematological abnormality. If the patient is anaemic then it can be associated with acute blood loss or renal failure.

Normocytic: A red cell of normal size and shape.

Pappenheimer bodies: Red cell inclusions that contain iron. Often seen post splenectomy.

Poikilocytes: Red cells of abnormal shape. A common, non-specific finding in many haematological abnormalities. Usually caused by the production of abnormal cells or damage to the cells in vivo. Teardrop poikilocytes are characteristic of marrow fibrosis.

Polychromasia: Red cells that stain pinkish-blue. These are early reticulocytes, associated with an increase in erythropoiesis, as in the successful treatment of, or response to anaemia or as a response to bleeding or haemolysis.

Rouleaux: Stacking of red cells. Excess rouleaux is caused by an increased plasma protein concentration. May indicate a paraprotein or inflammation

Schistocytes: Fragments of red cell. These are caused by mechanical damage to red cells. Most common causes are microangiopathic haemolytic anaemia or mechanical haemolytic anaemia.

Sickle Cells: Red cells with a typical curved shape like a sickle and found in sickle cell anaemia.

Spherocytes: Red cells that are more spherical than biconcave. These cells have lost some membrane without losing any of the cell content. Present in most forms of haemolysis, in hyposplenism and in hereditary spherocytosis.

Target cells: Appear as the name suggests. Target cells are most often associated with liver disease, iron deficiency and the haemoglobinopathies.

2.19.2. White cell morphology

Abnormal Lymphocytes: Lymphocytes with morphology that is not normal and the cause is likely to be malignant. If the cell line can be clearly identified, these may be quantified as part of the white cell differential (lymphoma cells/hairy cells)

Hypersegmented Neutrophils: Increased neutrophil lobulation. This is often associated with megaloblastosis (B12 or Folate Deficiency or drug induced) and may be seen in reactive states.

Left shift to the Neutrophils. This refers to a reduced number of lobes, and is associated with immaturity. In infection is often seen together with toxic granulation.

Pelger Huet Anomaly: A form of reduced neutrophil lobularity. Reduced lobulation of the neutrophils not associated with immaturity. May be

inherited or seen as a consequence of myelodysplasia or after treatment with cytotoxic drugs.

Plasmacytoid Lymphocytes: These lymphocytes are intermediate between the lymphocyte stage and the antibody producing plasma cell. They are most often reactive in nature and seen in acute infections

Reactive lymphocytes: Lymphocytes with morphology that is not normal, but with a likely non-malignant cause (shock/viral infection).

Smear Cells: Abnormal lymphocytes which are very fragile and break up when a blood film is made. Found in Chronic Lymphocytic Leukaemia.

Toxic Granulation: Increased neutrophil granulation. Usually seen as a response to infection.

2.19.3. Platelet morphology

Clumped Platelets: Platelets are sticky by nature and have a tendency to stick to each other in vitro. Sometimes this can be a one off event, which is the first stage of the sample clotting.

With some individuals this will happen on every occasion. Because the platelets are stuck together they can not be accurately counted. A CPT bottle can be obtained from the laboratory, which will usually reverse the clumping process.

Hypogranular (Agranular) platelets: Normal platelets contain granules that are necessary for the normal function of the cell. The presence of platelets with reduced or absent granules is therefore significant. This can be caused by the sample starting to clot, by disease such as myelodysplasia, by treatment, particularly chemotherapy, or rarely as an inherited disorder.

Giant platelets: Platelets normally vary considerably in size, but occasionally platelets as big or bigger than red cells can be seen. These giant platelets can be seen as a response to severe thrombocytopenia or in disease such as essential thrombocytosis.

2.20. Malaria

Routine Malaria - The diagnosis of malaria requires the careful examination for 20 minutes of blood films stained at an alkaline pH. An additional test using a monoclonal antibody directed against a Falciparum malaria protein may also be used. The blood films are best made in the laboratory from an FBC sample less than two hours old. The parasites will start to deteriorate after a few hours and a sample over 24 hours old will not be tested.

2.21. Haemoglobinopathy Screening

Haematology offers a full haemoglobinopathy screening service in association with The Department of Haematology, Torbay Hospital,

A basic screen using High Performance Liquid Chromatography (HPLC) is used to give Hb A, HbA2 and HbF levels with identification of abnormal haemoglobins such as sickle cell, or Hb C. This technique is also used in the diagnosis of alpha and beta thalassaemias.

A full DNA analysis of globin chains is available for sub-typing haemoglobinopathies such as in alpha thalassaemia. This is performed at the discretion of the Consultant Haematologist.

2.22. Antenatal Haemoglobinopathy screening

2.22.1. The overall aim of the National Antenatal Screening Programme is to offer sickle cell and thalassaemia screening to all eligible women and couples in a timely manner in pregnancy. The screening programme facilitates informed choices regarding participating in the screening programme and provide help for those couples identified by screening as being at higher risk. For all pregnant women presenting to maternity services in England, sickle cell and thalassaemia screening is an integral part of the early antenatal care offered to all women at first presentation to primary care or first booking.

2.22.2. Women undergoing antenatal booking are assessed for potential Haemoglobinopathy using the family origin questionnaire (FOQ) and for thalassaemia using the MCH.

2.22.3. The following stages are involved:

- Initial Haemoglobinopathy screening – Please send FOQ (white top copy only) with FBC sample and antenatal booking request form to Haematology (do not sent in same bag as Group and Save). Please enter EDD on FOQ and do not make any entry in the declined box unless patient specifically declines screening.

- Criteria for which the woman's sample is further screened:

    - MCH <27 (lab will check history) - O/C area midwife will be automatically contacted to arrange partner sample. Please include female ID information on request.

    - If FOQ positive for **either woman or partner (**which is any ethnic descent other than pure North European Caucasian) – identified by ticks in the Gold boxes. Laboratory will send women's sample to the referral laboratory. Partner sample is not required at this stage for this screen.

- Haemoglobinopathy investigation – if variant haemoglobin detected or potential thalassaemia, the sample is referred to Torbay Hospital.

2.23. MARKERS IN THE DIAGNOSIS AND MONITORING OF INFLAMMATORY DISORDERS

From Presentation to Test: *A Guide to Appropriate Use of Markers in Diagnosis and Monitoring of Inflammatory Disorders*

CRP only rises substantially in bacterial/fungal infection and only very modestly in viral infection.

We recommend that these tests are performed once only unless there is compelling clinical evidence meriting a repeat test.

Clinical Suspicion based on history and examination	**First Line Diagnostic Test(s)**	**Second Line Diagnostic Test(s)**	**Monitoring**
Bacterial Infection	CRP		CRP
Arthritis with synovitis	RF, CRP	DNA, ENA ANA in women <60yr with clinical suspicion of SLE	CRP
SLE/Lupus/ Scleroderma/ MCTD	ANA,CRP *(does not rise in uncomplicated SLE but rises c infection)*	DNA, ENA ENA, ACA if pregnant Igs, C3, C4, ACA	C3, C4, CRP (Occasional ANA, DNA)
Vasculitis/PAN/ Arteritis	ANCA, ANA, C3, C4, CRP, RF	Igs, Cryoglobulins (if clinically indicated), DNA, ENA	C3, C4, (DNA if SLE), ANCA if positive (max every 3 weeks) CRP
Temporal Arteritis/ Polymyalgia Rheumatica	CRP (or ESR)		CRP (or ESR)
Inflammatory bowel disease	CRP (in Crohn's but not uncomplicated UC)		CRP in Crohn's
Hodgkin's Disease	Biopsy		ESR
Myeloma/Raised total protein/ Paraproteinaemia	U+E, Ca^{++}, LFT Protein Electrophoresis Urinary Bence Jones	*Viscosity only if clinically indicated*	U+E, Ca $^{++}$, LFT Protein Electrophoresis Beta 2 microglobulin BJP

2.24. Immunology

Please note that all Immunology requests must be accompanied by full and relevant clinical details or the request will be rejected.

2.25. Diagnostic flow cytometry

The department is equipped with a state of the art multiparametric flow cytometer and sample preparation module for the diagnosis and monitoring of Haematological malignancies and Immune surveillance.

2.26. Immunophenotyping and flow cytometry

Requests for Immunophenotyping of suspected Haematological malignancy are only accepted from the Consultant Haematologists who should be consulted in all instances where such a diagnosis is being considered.

2.27. CD4 counts on HIV/Immune deficient patients

2.27.1. Requests for CD4 counting and immune surveillance are only accepted from the Consultants in GU medicine or the Consultant Haematologists. The department will not process any requests received without referral from either of these sources.

2.27.2. The Derriford Combined Laboratory currently offers a sub-regional immunology diagnostic service to South & West Devon and Cornwall. The repertoire offered includes immunochemistry, autoantibodies, cellular immunology and allergy tests. The majority of the tests are performed in-house, but a number are sent to specialist reference centres. In addition, a clinical immunology service is available for patients with primary immune deficiencies and allergies (including skin prick testing).

2.28. IMMUNOLOGY DIAGNOSTIC SCREENING TESTS AND ASSOCIATED CLINICAL CONDITIONS:

Addison's Disease

Adrenal antibodies are present in 50% of patients with Addison's disease. At least 40% of patients have at least one other autoimmune endocrinopathy.

Allergy

IgE is raised in patients with atopy (eczema>asthma>rhinitis). Allergen-specific IgE antibodies (RASTs) are present in patients with type I hypersensitivity reactions, but not pseudoallergic reactions. The request for allergen specific IgE must be based on the clinical history.

Anaphylaxis

Serum tryptase levels are elevated following mast cell degranulation due to anaphylaxis (type I hypersensitivity or pseudoallergic reactions) or mast cell syndromes (rare). Blood should be collected within 3 hours of the event. Urinary n-methyl histamine levels are elevated following mast cell degranulation as for serum tryptase above. Urine should be collected between 1 and 4 hours of the event. If the patient was in contact with latex rubber, a specific IgE to latex should be requested. Contact lab for specific advice on sampling and timing of sampling.

Antiphospholipid syndrome

Anticardiolipin antibodies are present in the antiphospholipid syndrome (arterial & venous thrombosis, recurrent foetal loss, thrombocytopaenia). The antiphospholipid syndrome can be primary or secondary to a CTD such as SLE. If the antiphospholipid syndrome is suspected, a lupus anticoagulant screen should always be performed regardless of the cardiolipin result (Haematology section of Combined Laboratories)

Coeliac disease

Tissue transglutaminase is used as the screening test for Coeliac disease, if this is positive the laboratory will automatically perform an endomysial antibody test for confirmation.

Connective tissue diseases

Antinuclear antibodies are present at high titre in SLE and other connective tissue diseases and at lower titre in rheumatoid arthritis, other autoimmune diseases and in 10% of normal elderly. A homogenous pattern is associated with dsDNA antibodies, while a speckled pattern is associated with antibodies to extractable nuclear antigens (ENA). The laboratory will automatically perform dsDNA and ENA antibodies where appropriate.

Antibodies	Disease associations
dsDNA antibodies	SLE
ENA antibodies:	
Ro (SSA)	Sjogren's/SLE/neonatal lupus
LA (SSB)	Sjogren's/SLE/neonatal lupus
Sm	SLE
RNP	MCTD/SLE
Jo-1	Dermatomyositis/polymyositis
Scl-70	systemic sclerosis

Goodpasture's syndrome
GBM antibodies are present in 75% of patients with biopsy-proven anti-GBM disease.

Hereditary angioedema
This condition is very rare, is associated with recurrent angioedema but not urticaria and there is usually a positive family history. Complement C4 levels are invariably low and C3 levels normal in patients with this condition. The diagnostic test, C1 esterase inhibitor, will only be performed on patients with a low C4 or a family history of this condition.

Immune deficiency
Humoral immunodeficiencies usually present with recurrent bacterial infections. The basic screening test for this condition is total serum immunoglobulins. IgG subclasses and specific antibodies to pneumococcus and H. influenzae b may sometimes be necessary. Cellular immunodeficiencies usually present with recurrent viral or opportunistic infections. The basic screening test for this condition is FBC and differential. Lymphocyte phenotyping and T cell functional studies may sometimes be necessary, but these should be discussed with the laboratory beforehand.

Liver autoimmunity
Smooth muscle antibodies are present in 95% of patients with type I chronic active hepatitis (CAH) but are relatively non-specific. Liver-kidney-microsomal antibodies are present in patients with type II CAH. Mitochondrial antibodies are present in 95% patients with primary biliary cirrhosis (PBC). M2 antibodies are even more specific for PBC and are automatically performed by the laboratory when a positive mitochondrial antibody is detected.

Myasthenia Gravis
Acetylcholine antibodies are present in 85% of patients with myasthenia gravis.

Myeloma
The basic screening test for myeloma is total serum immunoglobulins and electrophoresis and urinary Bence Jones protein. The laboratory will automatically characterise and quantify any paraprotein found.

Differential diagnosis: monoclonal gammopathy of undetermined significance. Contact consultant haematologists for advice.

Rheumatoid arthritis
Rheumatoid factors are found in 70% of patients with rheumatoid arthritis (seropositive RA). Another 30% of patients have rheumatoid arthritis but do not have rheumatoid factors (seronegative RA). Rheumatoid factors can also be found in patients with other connective tissue disorders.

Skin autoimmunity

Circulating basement membrane antibodies are found in pemphigoid and intercellular cement antibodies in pemphigus.

Thyroid autoimmunity

Thyroid peroxidase antibodies are found in patients with autoimmune thyroiditis (Hashimoto's 95% and Grave's 70%). Thyroid stimulating hormones (TSH) receptor antibodies are found in 90% of patients with Grave's thyrotoxicosis.

Vasculitis

Anti-neutrophil cytoplasmic antibodies (ANCA) are found in patients with vasculitis, but can be non-specific. The c-ANCA pattern is associated with Wegener's granulomatosis and microscopic polyarteritis (85%) while the p-ANCA pattern is found less commonly in Wegener's and microscopic polyarteritis (10%) but mainly in other vasculitides such as Churg-Strauss syndrome, SLE and rheumatoid vasculitis. The specificity of a positive c- or p-ANCA is determined by measuring proteinase 3 (PR3) and myeloperoxidase (MPO) antibodies which are the major target antigens respectively. In the case of a c-ANCA, occasionally a MPO specificity can be found. These tests are automatically performed by the laboratory when a c- or p-ANCA is detected.

Further information on the Immunology service can be obtained by contacting:

- Nigel Oakes on extension 3040 (RCH)
- Dr Claire Bethune, Consultant Clinical Immunologist for Clinical advice Tel Ext:52406 (Derriford Hospital)
- Paul Cooper for Laboratory advice/results – Tel Ext: 52293 (Derriford Hospital)

Histocompatibility testing (Tissue Typing)

The Immunology laboratory (at Derriford Hospital) performs molecular typing for HLA A,B,C,DR and DQ genes. HLA allo-antibody screening and indentification, together with lymphocytotoxic and flow cytometric crossmatching, are available for the renal transplant programme. Contact the laboratory for further information: Tel Ext: 52390.

2.29. Molecular Biology Tests

The molecular biology section (at Derriford Hospital) offers a range of tests useful in the diagnosis and monitoring of disease progression in patients with various haematological malignancies as well as some genotyping tests for coagulopathies and hereditary haemochromatosis.

These are all polymerase chain reaction (PCR) based tests that require purified DNA or RNA. The table below shows the tests currently offered and which nucleic acids are used in each test. This is important for RNA-based tests as RNA is very labile and these samples must be received for processing by the laboratory within 12-24 hours of removal from the patient.

Samples that can be tested include peripheral blood, bone marrow, CSF, ascitic fluid, fresh and paraffin-embedded tissue, bone marrow trephines (if decalcified with EDTA). The appropriateness of samples and their sending can be discussed with the laboratory – Tel Ext: 2408

DNA TESTS	**RNA TESTS**
Factor V G1691A (Leiden)	**TCR-Beta PCR for T cell clonality**
G20210A prothrombin variant	Cyclin D1 over-expression in MCL
Hereditary haemochromatosis	t(9;22) translocation – Ph chromosome
IgH PCR for B cell clonality	t(4;11) translocation of childhood ALL
TCR-Gamma PCR for T cell clonality	t(8;21) translocation of AML M2
t(11;14) translocation of mantle cell lymphoma	t(15;17) translocation of AML M3
t(14;18) translocation of follicular lymphoma	

The laboratory also offers Quantitative Real-Time PCR testing for haematological malignancies such as CML. Contact the Immunology lab at RCH (ext 3040) in the first instance for advice.

Results are normally available within 1-2 weeks but can take longer

Please note: If sending samples for other tests, ensure a separate sample is included for molecular biology tests.

3. Department of Clinical Microbiology

3.1. Taking Specimens

Specimens must, where possible, be obtained before antimicrobial agents have been administered. If administered, please ensure they are stated in the clinical details section of the request form.

An adequate quantity of material should be obtained for complete examination. **Always send pus rather than a swab of the pus, volume allowing**.

The specimen selected should be representative of the disease process, e.g. material swabbed from the opening of a sinus tract is more diagnostic than material obtained by curettage or biopsy of the base of the tract.

Scrupulous care must be taken to avoid contamination of the specimen by the micro-organisms normally found on the skin and mucous membranes.

Sterile equipment and aseptic technique must be used for collecting specimens, particularly those from normally sterile sites.

Material must be forwarded promptly to the laboratory. Swabs for culture and sensitivity must be placed in transport medium and swabs for MRSA screening should be submitted using the red topped Transwabs (no transport medium).

Please contact the laboratory if there is any doubt about the best specimen to take or concerning the availability of a test.

3.2. Cultures

Microbes take time to grow. The final results of cultures and antimicrobial susceptibility tests may take from 24 hours for urine specimens to many weeks for mycobacterial culture. Viral culture may also be prolonged. From knowledge of the likely antimicrobial sensitivities a medical microbiologist can usually advise on appropriate therapy following examination of preliminary cultures and before antimicrobial susceptibility tests are available. Interpretation of results can only be attempted if adequate clinical details are given on the request form.

3.3. Notes On Collection Of Samples

3.3.1. **BACTERIOLOGY**

<u>BLOOD CULTURES</u>

Please see the document Guidelines on Blood Culture Collection which is available on the Intranet Documents Library.

THROAT SWABS

Corynebacterium - throat swabs will only be investigated for this organism when one or more of the following risk factors are reported:

- membrane or membranous pharyngitis/tonsillitis
- travel overseas (especially former USSR, Africa, South America or South-East Asia) within the last 10 days
- recent contact with someone who has travelled overseas recently (anywhere - travel or contact with travellers in the past 10 days is most likely to be relevant to the risk of diphtheria)
- recent consumption of raw milk products (C. ulcerans)
- recent contact with farms/farm animals or domestic animals (C. ulcerans)
- the patient works in a clinical microbiology laboratory or similar where Corynebacterium species may be handled

Diphtheria – if suspected, give anti-toxin immediately - never wait for the laboratory result before instigating therapy. In addition, inform a medical microbiologist and report to the Consultant for Communicable Disease Control (CCDC), Tel. No. (0844 225 3557) without delay.

Please note: if it is stated in the clinical details section of the request form that the patient has had recurrent infections and/or failed treatment (especially for those patients under the age of 25years) we will examine the specimen for *Arcanobacterium haemolyticum*

GENITAL TRACT SWABS

Genital tract swabs

Separate samples should be collected into appropriate transport media for detection of viruses or *C. trachomatis*

If *Herpes simplex* infection is suspected send an additional UTM from the lesion. Give complete clinical details on the form; state in particular if the patient has an IUCD in situ, suspected pelvic infection and/or discharge. State on the label and form which site has been swabbed.

Urethral swabs

Urethral swabs may be useful for the diagnosis of gonorrhoea. They must be taken with care - avoid contamination with flora from the vulva or the foreskin. Thin swabs are available for this purpose and should be sent to the laboratory as soon as possible in charcoal transport medium.

The patient should not have passed urine for at least one hour. For males, if a discharge is not apparent, attempts should be made to "milk" exudate from the penis. The swab is gently passed through the urethral meatus and rotated. Place the swab in charcoal transport medium.

Placental swab
Placental swab taken post delivery.

Rectal swabs
Taken via a proctoscope

Fluids and pus
These are taken from the fallopian tubes, tubo-ovarian and Bartholin's abscesses, etc during surgery.

INTRAUTERINE CONTRACEPTIVE DEVICES (IUCDS)

The presence of an IUCD may be associated with Pelvic Inflammatory Disease (PID) or salpingitis. Infections of the upper genital tract are commonly referred to as pelvic inflammatory disease (PID) and are often accompanied by fever, leucocytosis, dyspareunia, intra-menstrual bleeding and chronic pelvic pain.

National Guidelines recommend that IUCDs are only cultured when supported by relevant clinical details i.e. PID or other inflammatory conditions. If this information is not provided the specimen will be rejected and not investigated. *Health Protection Agency. The investigation of genital tract specimens. BSOP 28i4.1. Issue 4.1. Issue date: 03.05.2005.*

SPUTUM/ BRONCHOALVEOLAR LAVAGE (BAL)/ COUGH SWABS

Do not collect shortly after the patient has been drinking, eating or cleaning the teeth. Remember that prior antimicrobial therapy may prevent the isolation of respiratory pathogens.

Importantly, please indicate if the patient has bronchiectasis, cystic fibrosis, ciliary dyskinesis, is immunocompromised or on steroids.

The material required is sputum from the lower respiratory tract expectorated by deep coughing. When the cough is dry, physiotherapy, postural drainage or inhalation of an aerosol before expectoration may be helpful. Saliva and postnasal secretions are not suitable.

BAL - it is difficult to be specific on volume required; in principle as large a volume as possible is preferred.

If Allergic bronchopulmonary aspergillosis (ABPA) is noted in clinical details we will perform fungal microscopy and culture

Legionella culture and fungal culture will be performed if atypical pneumonia suspected.

For mycobacterial investigation submit three sputum samples on consecutive days requesting mycobacterial / AAFB investigation. For other sites please contact medical microbiologist to discuss testing.

FAECES

Do not send more than one specimen from the same patient on the same day. If more than one specimen is taken on the same day the specimens are pooled, as shedding of faecal pathogens tends to be intermittent.

Other specimens are of little value for the isolation of faecal pathogens.

Cryptosporidium oocysts
Clinical details must **include the following criteria:**

- All general practice patients < 45 years old
- Paediatric patients
- Neutropaenia (as indicated in clinical details)
- Travel abroad
- Unconfirmed outbreaks
- HIV positive patients (as indicated in clinical details)
- Contact with confirmed cases or animals (as indicated in clinical details)
- Or if a specific request is made by telephone to perform this test

Faecal ova, cysts & parasites
Clinical details must include the following criteria**:**

- Travel to Asia, Africa, South America, Caribbean, Central America and Eastern Europe
- Persistent diarrhoea or loose stools for more than 2 weeks
- Eosinophilia
- Weight loss / failure to thrive

In the absence of relevant clinical details samples will not be tested for ova, cysts and parasites unless the laboratory is contacted by telephone or email.

For parasitology please submit at least three specimens of faeces, passed greater than 24hrs apart, marked “? Ova” with relevant clinical details. It is recommended that specimens are collected every other day. Unless the patient has severe diarrhoea or dysentery, no more than one specimen should be examined within a single 24 hour period, as shedding of cysts and ova tends to be intermittent. Please give any clinical details especially travel abroad or importantly note duration time of symptoms. If *E. histolytica* or *G. lamblia* are suspected and the first three specimens are negative, ideally, three additional specimens should be submitted at weekly intervals.

Giardia

Fresh, unpreserved specimens should be transported immediately; they will not survive if the specimen dries out. Cysts will not form once the specimen has been passed. If the specimen is liquid it should be examined, ideally within 30 minutes from the time of collection. Soft stools should preferably be examined within one hour of passage. Hot stools should be examined within 30 minutes for the presence of trophozoites to confirm a diagnosis of Amoebic dysentery. After 30 minutes cysts will form and this diagnosis cannot be confirmed.

Unformed, semi-formed and liquid faecal specimens submitted from **General Practice** will undergo a direct examination for Giardia and *Entamoeba*

Clostridium difficile

Testing for Cl. difficile will only be undertaken on the following groups of patients

All in-patients >2yrs

GP patients >2yrs with

- Pseudomembranous colitis
- Ulcerative colitis
- Antibiotic-associated diarrhoea
- On antibiotics
- Neutropenia with semi-formed/unformed/liquid faeces
    - As part of an outbreak
    - Semi-formed/unformed/liquid specimens from patients >65yrs of age
    - When requested

Vibrio species

Tested if clinical details state

- Travel to a **specified** country from one of the following continents: Asia, Africa, South America, Caribbean, Central America and Eastern Europe in three weeks prior to specimen submission.
- A mention of seafood consumption
- Or if a specific request is made by telephone to perform this test

Enteric clearance of pathogens

The microbiological screening of faeces specimens for clearance of pathogens is considered unnecessary, except in infections with *Salmonella typhi / paratyphi*, amoebic dysentery and *Shigella dysenteriae* serotype 1 and Vero-toxin producing *E. coli* O157. All but the last of these organisms are very rare in Cornwall.

In-patient faecal samples

The bacteriological screening of stool specimens from in-patients is not required, unless admitted with diarrhoea. However, locally we will continue to investigate for *Salmonella spp* as well as *Clostridium difficile,* with the exception of the following circumstances:

- Those in-patients suffering diarrhoea within three days of admission – ascertained from CORE.
- Patients who are HIV positive (as indicated in clinical details)
- Patients with neutropaenia (as indicated in clinical details)

If any of the three criteria above apply full investigation will be performed.

Please do NOT submit specimens for Clostridium difficile toxin testing within **four** weeks of a previous positive (they will NOT be tested). Please contact a medical microbiologist to discuss if repeat symptoms appear within 28 days.

Viral gastroenteritis

Paediatric patients under 5 years are routinely investigated for rotavirus and adenovirus. Faecal samples from outbreaks of vomiting and/or diarrhoea may be tested for viral pathogens, but these tests are not usually performed unless requested by the Infection Prevention and Control teams.

URINE

Clean-voided midstream urine is preferred for bacterial culture.

The use of boric acid containers allows specimens to be processed up to four days post collection as long as the correct volume is taken. It is not necessary to refrigerate the sample.

To ensure the correct concentration of boric acid is achieved (1.9%), the container must be filled to within 1cm of the fill line marked on the label. If this is not achieved the specimen will not be tested.

Boric acid containers are only suitable for URINE specimens requiring routine bacterial investigation. For paediatric patients or other patients where obtaining sufficient volume is a problem, smaller (5ml) boric acid containers are available from the laboratory.

Bag urine

Used commonly for infants and young children. The sterile bags are taped over the genitalia and the collected urine is transferred to a sterile leak proof container. There are frequent problems of contamination with this method of collection. Bag urine samples will not have flow cytometry result as fibres can interfere with the analyser.

Ileal conduit - urostomy urine
Results from this type of specimen may be difficult to interpret.

Ureteric urine
Paired urine samples are obtained from each ureter during cystoscopy via ureteric catheters inserted from the bladder.

Urines may also be sent following nephrostomy, surgery or bladder washout.

Localisation culture for diagnosis of prostatitis
The following specimens are collected:

- the initial 5-8ml voided urethral urine (VB1)
- MSU (bladder urine) (VB2)
- expressed prostatic secretions following prostatic massage (EPS)
- the first 2-3ml voided urine following prostatic massage (VB3)

VB1 is tested for urethral infection or inflammation and VB2 is tested for urinary bladder infection. If VB1, 2 and 3 are positive, this indicates acute bacterial prostatitis.

Flow cytometry
Urine cytometry counts the number of white blood cells, epithelial cells, casts and bacteria. This technique is approximately four times more sensitive than microscopy and can confidently identify negative urine samples without bacterial culture. The only exceptions to this will be those recommended by the National guidelines i.e. specimens from children (< 6yrs), pregnant women and where 'immunocompromised' is clearly written in clinical details or if a specific request is made by telephone to perform culture.

Most samples with negative flow cytometry will be reported as negative on the day of receipt with no further investigations undertaken. Those with elevated counts and those recommended in the National Guidelines will be cultured.

The flow cytometry result will be available the same day of receipt by accessing patient results on the computer.

Flow Cytometry Report

White blood cells	X.X x 10^6/L (Normal range = 0-40)
Squamous epithelial cells	Y.Y x 10^6/L (Normal range = 0-50)

Culture

More than 40 **x 10^6/L** white blood cells is considered to be significant pyuria. If a second urine specimen is received which yields sterile pyuria we will culture for fastidious micro-organisms, but you may wish to consider submitting a further specimen for Chlamydia or mycobacterium investigation, if appropriate.

The presence of epithelial cells on flow cytometry indicates contamination and the reliability of the culture result is called into question.

Long-term catheters are invariably colonized with one or more micro-organisms. Treatment with antibiotics should be reserved for those with signs of systemic infection. Increased fluid intake, acidification of the urine and/or catheter change may be beneficial. Bladder washouts with antiseptics may be of value but may increase the risk of further introduction of infection.

If repeat specimens yield results which indicate contamination you may wish to use instrumentation which facilitate the collection of urine avoiding contamination, e.g. the Whiz Midstream device, which has been designed specifically for women to give a mid-stream specimen of urine not only with less spillage and hence greater dignity, but also with a much lower risk of contaminating the sample.

Schistosomiasis

Mid-day specimens of urine should be collected for the investigation of schistosomiasis in **non-boric acid container**. Please note: collection of the total urine passed during the time period 1000h and 1400h has shown that the maximum concentration of eggs are excreted. Large 250ml containers are available from the laboratory.

Mycobacterial investigation

Please submit three consecutive early morning urine specimens, in 250 ml sterile containers, with no preservatives.

CSF
Ideally, a minimum volume of 1ml will be provided. For *Mycobacterium* species, as large a volume as possible this is particularly important if tuberculosis infection is suspected where small numbers of organisms may be present. Indicate if cryptococcal investigation required.

Common practice is to send the first and last specimens taken for microbiological examination and the second specimen to chemistry for investigation. If subarachnoid haemorrhage is suspected, send the first and third samples (clearly labelled) so that differential red cell counts may be attempted.

Specimens should be transported in the ATTS allowing rapid investigation. Do not refrigerate specimen as cells disintegrate and a delay may produce a cell count that does not reflect the clinical situation of the patient.

The results of microscopy are available within one hour on Winpath Ward Enquiry and any positive cultures are always telephoned (routine neurological specimens are not telephoned).

Normal CSF values

ucocytes	eonates (< 4 weeks old)	30 cells x 10^6/l
	weeks -4yr old	20 cells x 10^6/l
	r-puberty	10 cells x 10^6/l
	lults	5 cells x 10^6/l
ythrocytes	ewborn	675 cells x 10^6/l
	lults	10 cells x 10^6/l

CSF samples taken after routine neurological examination or from leukaemic patients without symptoms do not have a Gram film or culture performed unless the leucocyte count is raised (>5wbc x 10^6/L).

SKIN, WOUND AND VENOUS LEG ULCERS SWABS

Always state the site and nature of the wound on the request form. This is essential, as it dictates method of investigation and interpretation of results. If a collection of pus is present, aspirate this material with a sterile syringe and needle and transfer to a sterile universal container. Do not send specimens from the same wound on consecutive days, as this is a waste of valuable resources.

Routine processing of superficial swabs of ulcers should be discouraged. Swabbing dry crusted areas are unlikely to be helpful. Royal College of Nursing guidelines 'The management of patients with venous leg ulcers. Clinical Practice Guidelines 1998' indicate that processing leg ulcers should only occur if supported by relevant clinical details, as indicated on

the form, as evidence of clinical infection, i.e. inflammation / redness /cellulitis, increased pain, purulent exudates, foul odour, rapid deterioration of the ulcer or pyrexia.

Corynebacterium

If submitting a wound swab from a patient who has travelled abroad where they may have obtained an insect bite, please include details of this in the clinical details section of the request form. The bacteria *Corynebacterium diphtheriae* and *Corynebacterium ulcerans* can cause cutaneous diphtheria by colonising these bite sites. These are cultured on a specialised plate which has a very short shelf-life. Providing us with relevant information will allow us to eliminate these bacteria from our investigations.

If no travel information is noted from these specimen types we will assume that these agents are not responsible for infection and will not culture for them.

3.3.2. MYCOLOGY

The laboratory offers a mycology service in addition to serological tests listed in the table at the end of the handbook.

Collection of samples for mycology culture

Skin

Send enough material for both microscopy and culture. At least 5mm^2 of skin flakes are required. Swabs are of no value for the investigation of dermatophyte infections.

Nails and hair

Nail clippings should include the full thickness of the nail and extend as far back from the edge as possible. Hair should be plucked from affected areas together with skin scrapings from associated scalp lesions (please note cut hair shafts are inappropriate).

Hair

Hair should be plucked from affected areas together with skin scrapings from associated scalp lesions (please note cut hair shafts are inappropriate).

3.3.3. VIROLOGY

The Virology department performs serology, detection of viral and bacterial antigens and an increasing menu of molecular tests. Virus culture has been replaced by these non-culture methods and is no longer available. Details of specimen selection, test modality and turnaround times are given in Table 1 of this guide. The following is a brief guide to the services we offer.

Atypical pneumonia
Serology for the investigation of atypical pneumonia is referred to another laboratory. Investigations will not be performed without a date of onset of symptoms and a relevant clinical history. For respiratory serology, paired blood samples taken in the acute phase of the illness and one 10-14 days after onset are generally required.

Samples are routinely investigated for *Mycoplasma pneumoniae*, respiratory Chlamydia and Q fever. A wider range of investigations is available after discussion with the laboratory.

Chlamydia trachomatis
Genital tract, ocular and other specimens are currently tested for *Chlamydia trachomatis* DNA using a commercial polymerase chain reaction (PCR) assay. In certain settings (GU medicine and Sexual Health clinics the same samples are also tested for *Neisseria gonorrhoeae* DNA). In all other areas gonorrhoea testing is performed by culture using the techniques described above in the Bacteriology section.

Suitable specimens for the diagnosis of genital tract infection in women are vulvovaginal and cervical swabs taken using the Chlamydia collection kits. Detailed instructions are included with the kits. Men should send a first voided urine sample (do not send a boric acid urine container) ensuring that the COBAS yellow-topped Chlamydia Urine sample is filled within the marked "window" on the container. Sampling from other sites (e.g. rectum, throat etc.) should preferably be performed by experienced staff at the GUM clinic.

Eye swabs should be taken before any fluorescent dye is added to the eyes. Use a separate COBAS yellow-topped "female" Chlamydia swab to sample each affected eyelid conjunctiva**. Do not** use Copan mini UTM-RT collection kits for this type of specimen.

Specimen storage and transportation
Chlamydia swabs should be transported to the laboratory as soon as possible. Where immediate transport is not possible or samples are posted to the laboratory the samples can be stored at room temperature without affecting the test result.

Glandular fever
Investigation of typical glandular fever in adolescents and young adults is performed using a Paul-Bunnell test. For other age groups, complicated illness or where greater diagnostic certainty is required, EBV-specific serology can be performed in the laboratory.

Hepatitis

Diagnostic hepatitis testing is guided in the laboratory by clinical details and liver function tests. Blood will not normally be tested for most viruses unless LFTs have been performed. Unless clinical details dictate otherwise, ALT levels are used to determine which tests to perform according to the following schedule:

- ALT levels <100 iu/ml are investigated for Hepatitis B and C.
- ALT levels 100-400 iu/ml are investigated for EBV and CMV in addition.
- ALT levels >400 iu/ml are investigated for Hepatitis A and E in addition.

Please contact the laboratory directly to discuss the need for any additional tests.

Positive hepatitis serology will normally be confirmed with additional tests, which may delay the issuing of a final report.

Chronic hepatitis B or C may be treated with antiviral drugs. The response to therapy is monitored using quantitative molecular techniques (see “viral load” section). Please contact the laboratory to arrange these studies.

Immunity to hepatitis B following vaccination is determined by measuring anti HBs antibody. Details of vaccination history are required to interpret the results of this test and should accompany all requests. We routinely test non-responders to hepatitis B vaccine for evidence of previous hepatitis B infection using an anti HBc assay.

HIV

Serum from patients at risk or with suspected HIV infection is tested using a 4th generation ELISA for HIV 1 and 2 antibodies and p24 antigen. A same-day testing service is available after discussion with the laboratory. Reactive samples are referred to a specialist laboratory for confirmation, which may take a week. Note that antibodies may not be present in recently acquired infection (the “window” period) and re-testing 3 months post exposure is required to conclusively exclude infection. Further advice on HIV testing is available from the laboratory or Department of Genitourinary Medicine.

Influenza and other respiratory viruses

A same day PCR service is offered for influenza A and B, RSV, adenovirus, parainfluenza and human metapneumovirus in normal working hours Monday to Friday. To ensure same day testing, the laboratory should be informed and the specimens **must be delivered to the laboratory by 1100hrs**. Acceptable samples for this assay are nose and throat swabs collected using Copan UTM-RT collection kits, sputum, tracheal aspirates and nasopharyngeal aspirates (see “RSV” section for NPA collection guide).

Inoculation injuries ("needlesticks")
Samples should be collected from the source patient and the injured person according to local inoculation injuries protocol. It is important to indicate clearly which are the source patient and the recipient of the needlestick injury. The source patient must be counselled and will be routinely tested for Hepatitis B, C and HIV if requested. Blood from recipients will be stored without testing for two years. Individual cases should be discussed with the Occupational Health Department.

Meningitis/Encephalitis
In addition to bacterial culture of CSF and blood, molecular tests are available from specialist laboratories for detection of bacterial (*Neisseria meningitidis* and *Streptococcus pneumoniae*) and viral (usually HSV, VZV and enterovirus) pathogens in blood (bacterial only) or CSF. These tests are only referred when supported by relevant clinical information.

PUO
There is no "panel" of tests for the investigating "PUO". Please ensure that clinical details are given to guide investigation or discuss with the laboratory.

Quantiferon-TB Gold
This assay measures the T-cell response to antigens derived from *Mycobacterium tuberculosis*. When positive it reflects either latent or active tuberculosis. The main use for the test is to detect latent tuberculosis in contacts of cases or in patients starting immunosuppressive therapy in whom reactivation of tuberculosis is a risk.

<u>The test is only available from Monday to Thursday</u>. The timing of collection and submission of the kits is very important. Once the blood is drawn into the quantiferon tubes they must be shaken vigorously 10 times and returned to the laboratory before 1600hrs the same day. To obtain the collection kits please contact the laboratory. Full instructions accompany the collection kits.

Rashes in pregnancy
Rashes presenting in pregnancy or contact by pregnant women with rashes in others raises concerns about infections which may affect the woman or fetus. Testing of the pregnant woman's blood may be useful in this situation to determine susceptibility to infection.

For contacts of patients with vesicular rashes, including chickenpox and shingles, varicella immunity can be determined in contacts using a rapid blood test for VZV IgG. These results will be normally available on the day the specimen is received by the laboratory between Monday and Friday.

Non-vesicular rashes are due to many viruses including Rubella and Parvovirus B19 (human erythrovirus). Of these parvovirus is far more common. Blood samples should be taken from pregnant women with rashes or a history of contact, giving full details including the date of exposure and onset of rash. Please contact the laboratory if the patient is not known to be rubella immune so that additional testing can be performed.

RSV

Routine RSV detection is performed on nasopharyngeal aspirates (NPA) on weekdays using a respiratory virus PCR panel (see "Influenza and respiratory virus section above). At other times a commercial immunochromatographic device is used to detect RSV in upper respiratory tract secretions.

NPA samples should be obtained by aspirating from the nasopharynx using a trachea set specimen collector (Eros code FF H047). If secretions are scanty, sterile saline can be sucked through the collector to ensure the specimen is collected in the trap. The tubing should then be removed from the trap and replaced by the cap. The capped trap may be sent to the laboratory in the usual way.

Syphilis

Syphilis screening is performed on blood using a sensitive enzyme immunoassay (EIA). Patients reactive in this test are tested using a second, TPPA test to confirm the result. Reactive samples are referred to a specialist laboratory for further testing to determine the stage of infection.

The specialist laboratory will also perform RPR tests, which are used to monitor response to treatment and to detect re-infection in previously infected individuals. It is essential that adequate clinical details accompany all requests for syphilis serology to ensure that the correct tests are performed and properly interpreted.

Vesicular rashes: Herpes simplex, chicken pox and shingles

Serology is of limited value in the diagnosis of these infections. Sensitive molecular tests performed on virus containing samples are preferred. Swab lesions (ideally getting fluid from intact vesicle) using Copan mini UTM-RT collection kit (available from the Microbiology Laboratory supplies order line ext 4966). PCR-based detection of HSV 1 and 2 is available locally. Specimens requiring investigation for chickenpox/shingles will be forwarded to a reference laboratory for VZV PCR.

Viral load testing

These tests are performed using quantitative PCR techniques. HIV and Hepatitis C viral load testing is available locally for monitoring the response to antiviral treatment. These tests are usually performed at the request of specialist Genito-urinary medicine and hepatology clinics. Other users

should contact the laboratory before requesting these assays.

Hepatitis B (HBV) and CMV viral load testing are currently performed at specialist laboratories. HBV testing is mainly used to determine the infectivity of carriers and the response to antiviral treatment. CMV PCR is mainly used to monitor transplant recipients and other immunocompromised patients for active CMV infection.

Specialist reference tests

Many unusual or infrequently requested tests are available from reference laboratories (eg tests for tropical diseases, CJD, Whipple's disease, endemic mycoses, polyoma viruses) and can be arranged by the laboratory. Specialist molecular tests such as viral genotyping and resistance testing are also available. Please discuss with the laboratory before sending samples for any of these investigations.

APPENDIX 3. DIAGNOSTIC AND MOLECULAR PATHOLOGY DEPARTMENT

The Diagnostic and Molecular Pathology Department is divided into the following specialities:

1. **Cytopathology** provides the following:
    - National Health Service Cervical Screening Programme (NHSCSP)
    - Diagnostic Cytopathology services includes:
        - Head and Neck Fine Needle Aspiration Cytology (FNAC)
        - Liquid Based Cytology (LBC) Bronchial, Oesophageal and Common Bile Duct Samples
        - Breast Fine Needle Aspiration Cytology (FNAC)
        - Body fluid and aspirate cytology
        - EUS/EBUS (Endoscopic and endobronchial ultrasound) FNA service. Adequacy of the sample is assessed within the clinical setting. Samples include; Mediastinal lymph node FNA's (transbronchial (EBUS) and transesophageal (EUS)) and Pancreatic FNAs

2. **Histopathology** provides a diagnostic service for surgically excised and post mortem specimens and a frozen section service to the theatres.

Histopathology also provides the technical support for the MOHS service in the Dermatology department of the Royal Cornwall Hospital. MOHS is microscopically controlled surgery used to treat common types of skin cancer involving complete circumferential peripheral and deep margin assessment using frozen section histology. MOHS surgery allows for the removal of a skin cancer with very narrow surgical margin and a high cure rate.

3. **Molecular Cell biology Unit (MCBU)** utilises an extensive range of antibodies used in Immunology techniques for routine diagnosis and prognosis. It also provides the South West Peninsular Network with a Her2 referral service. The OSNA (one step nucleic acid amplification) technique is an intra-operative technique which is used to identifiy mRNA of cytokeratin 19 which is expressed by epithelial cells within metastatic cells. The lymph node is removed from the patient, processed and analysed by molecular technique at the site of the breast surgery in St Michael's hospital. This allows appropriate surgery to be undertaken in cases where patients are positive and thus prevents a future second operation.

4. Post Mortem suite at RCHT and body storage facility at WCH. As well as hospital cases autopsies are carried out on behalf of HM Coroner. Facilities are available for Home Office forensic autopsies.

5. DDMP SPECIFIC Form & Specimen Labelling Requirements

FORM LABELLING REQUIREMENTS	
Both Form & Specimen Mandatory (i.e. will be rejected if not given)	
Surname, Forename or coded identifier	All specimens
NHS / Hospital number or Date of birth	All specimens
Signature of the requester	All specimens
Date of collection	All specimens
Time specimen taken	Histology only
Sample type	All Specimens
Site and side	All specimens
Description of Biopsy	Histology only
Consultant or patient's GP	All specimens
Patient location or address	Cervical Cytology (desirable for diagnostic cytology)
Report destination	All specimens
Complete all boxes of HMR 101/5	Cervical Cytology
SAMPLE LABELLING REQUIREMENTS	
Surname, Forename	All specimens (coded identifier for GUM clinic cervical samples)
NHS / Hospital number or Date of birth	All specimens (except unknown patients).
Label frosted slide end (Full Name and Hospital No or NHS number or DOB and Sample type and Site / side)	Diagnostic Cytology
Sample type	All specimens
Site and side (if appropriate)	All specimens

6. Transportation of samples and special handling needs

Histopathology samples must never be delivered from GP's or hospitals via Public Taxi's. Only to be transported through NHS Couriers.

Specimen Type	Transportation details	Information / special handling needs
LBC Cervical Samples	**Samples from GP's / Community Clinics** - The samples are placed into the courier transportation boxes and delivered daily to the laboratory in accordance with Courier policies and procedures. Samples from the **Plymouth GPs** are placed into specific blue bags prior to transportation **Samples from Colposcopy** are transported to the laboratory by porter	All LBC vials must be sent in a clear specimen bag accompanied with a HMR 101/5 request form Due to the 14 day turn around time for Cervical samples. It is vital that they are sent to the laboratory on a daily basis (excluding weekends)
CSF	Specimen degrades quickly and should arrive in the laboratory within **one hour** of collection. The sample must arrive at the lab by 4pm to allow for processing time	All specimen containers must be placed into Cellular Pathology specimen bag with the completed request from attached prior to transportation
Breast FNAC's Mermaid Centre	Make sure the slide box is tightly sealed, an elastic band can be used, to prevent the slides from breaking during transportation in the air tube system	All specimen containers must be placed into Cellular Pathology specimen bag with the completed request from attached prior to transportation

Specimen Type	Transportation details	Information / special handling needs
Bronchoscopy Samples	Transported via Porter to the laboratory. The laboratory is sent a patient list for each clinic. Tuesday's samples should arrive in the laboratory by 16.30. Thursday's samples should arrive in the laboratory by 14.00. If samples have not been transported to the lab within the time frame, then a member of cytology staff contacts Endoscopy. To allow for processing time prior to MDT. Histology samples taken in RCHT ultra sound department on a Thursday afternoon will be collected by member of histology staff. Please ensure histology department are contacted for this collection on ext 2576	**Clinic times** Tuesday PM Thursday AM If Cytology and Histology samples are taken then samples should be placed into separate specimen bags with a completed request form for each department.
Diagnostic Cytology samples (RCHT)	Transported via porter or tube to the laboratory	Labelled Glass slides must be placed into a slide carried box. All specimen containers must be placed into Cellular Pathology specimen bag with the completed request from attached prior to transportation
Diagnostic Cytology samples (External) Including: Synovial Fluids for Crystal analysis	Via Courier service	All specimen containers must be placed into Cellular Pathology specimen bag with the completed request from attached prior to transportation

Specimen Type	Transportation details	Information / special handling needs
Head and Neck Clinic FNAC	Transported via porter or tube to the laboratory. (please make sure the slide box is tightly sealed, an elastic band can be used, to prevent the slides from breaking during transportation in the air tube system)	Labelled slides must be placed into plastic slide boxes, placed into a specimen bag accompanied with a completed request form.
EUS/EBUS FNA	BMS attendance at the clinic – specimens transported to the laboratory by these staff	As directed by staff in attendance at clinic
Routine Histology	All histology specimens should be transported in 10% neutral buffered formalin (DO NOT use Saline). 60ml pre-filled biopsy pots are available from either EROS. GP can request pots from Practitioner Support Services NHS Shared Business Services Camberwell House Grenadier Road Exeter Business Park Exeter Devon EX1 3LQ Hospital theatres, RAF St Mawgan, RNAS Culdrose and Bodmin Treatment Centre (BTC) can obtain a range of empty pots in various sizes from the histology department.	Volume of 10% formalin must be 5 x the volume of the specimen. **Under no circumstances must specimens containing formalin be sent by the air transport tube or Royal Mail Postal Service.** Histopathology samples must never be delivered from GP's or hospitals via Public Taxi's. Only to be transported through NHS Couriers.

Specimen Type	Transportation details	Information / special handling needs
Renal specimens	Lab staff will deliver the Hanks Medium ready for use on request. They will retrieve the specimen on phone call from the renal physicians. Un-used specimen pots must be collected by laboratory staff and NOT used.	Must be booked in advance by phoning ext 2576. Samples transported in Hanks medium obtained from laboratory.
Products of Conception / Termination of Pregnancy	**These specimens must be received in 10% buffered formalin**	Tissue samples before 24 weeks gestation containing products of conception, which are for histology must be accompanied by a Consent Form for funeral arrangements after pregnancy loss and a Cornwall Council Penmount Crematorium Form – Certificate of Medical Practitioner or Midwife in Respect of Foetal Remains. These forms on completion indicate what funeral arrangements are required once the histology has been performed. Such specimen types are will not be accepted / processed unless the correct documentation accompanies the specimens. These requirements are in line with the Human Tissue Authority. The forms are available on the RCHT document library as appendices of the Policy - Procedure for the Sensitive Disposal of Pre 24 week Fetal Tissue.
Dental specimens	Make arrangements with local GP for specimens to be collected by RCHT courier service.	Specimen pots must be contained within sealed bag attached to specimen request card.

Specimen Type	Transportation details	Information / special handling needs
Skin Biopsies for Immunofluorescence	Transported in Michel's medium obtainable from laboratory with 24hours notice.	Must be kept at room temperature and NOT refrigerated.
Multiple bowel biopsies	Acetate strips are available from the histology department. (strips cut 12 squares on the longer edge and 10 on the shorter).	The biopsies should be placed along one edge of the strip placing the first biopsy at the diagonal end of the strip. Biopsies should be placed one per square and place acetate strip in labelled biopsy pot
OSNA specimens	Transported on ice from St Michael's theatre suite to the OSNA laboratory in St Michael's hospital as quickly as possible. Must be booked in advance via the secretaries of the breast surgeons.	In order to preserve mRNA of potential epithelial metastatic cancer cells, the specimen must be kept cold.
Small Biopsies	Cell safes are available from the histology department	Biopsies should be placed in the deeper side of a cell safe and clicked shut and then place cell safe in labelled biopsy pot
Needle cores (prostate, breast etc.)	Biopsy insert papers are available from the Histology department	Needle cores to be placed directly onto cassette insert paper and then place paper in labelled biopsy pot
Frozen sections	**Must** be booked in advance with histology department. Specimen Must be received dry (not in formalin). Must be delivered immediately to the histology department and **handed** to a member of staff.	Portering or Theatre staff delivering specimens must hand the sample to a member of staff in Histology. Specimens must not be left in reception areas. Telephone/Pager number must be on request form to enable immediate reporting of results by telephone..

7. Key Factors affecting Performance or interpretation of histology

- Insufficient volume of fixative
- Inappropriate fixation time (24-48hrs optimal)
- Specimen for frozen section/direct immunofluorescence being placed in formalin.
- Dry specimens left in reception areas.
- Renal specimens being placed in formalin or incorrectly stored Hanks.
- Extreme hot/cold temperatures of formalin.

8. Availability of Clinical Advice and Interpretation

8.1. For all enquiries please contact the Diagnostic and Molecular Pathology Laboratory on **01872 252550.**

8.2. All results are typed into the Laboratory Information Management System (LIMS) (Winpath) and made available for all individuals registered with CITS to access Winpath Ward Enquiry, once the report has been authorised and released. Printed reports are sent to all requestors in the post once the reports have been authorised.

8.3. **Urgent reports** are usually available between 48 hrs and 7 working days from time of receipt.

8.4. **Routine Reports** are usually available within 2 weeks from time of receipt as per guidelines. Delays may occur due to additional test / techniques undertaken (this may be in our department or a more specialised hospital laboratory out of Cornwall) to aid in an accurate diagnosis, but a preliminary report is normally issued stating this. A supplementary report will be issued once a report from the referred laboratory is received.

8.5. **EUS/EBUS FNA** – an assessment of specimen adequacy only is provided immediately at clinic by BMS in attendance. The final report is usually available between 48 hrs and 7 working days from time of receipt.

8.6. **Routine Cervical Cytology** - In accordance with NHSCSP and Governmental guidelines.

9. Laboratories to which work is routinely referred:-

9.1. Renal biopsies

Tissue for electron microscopy is sent to Plymouth University for processing, however, the micrographs are interpreted by RCH histopathologists.

9.2. Muscle/nerve biopsies

The requester taking the biopsy must make arrangements for transport, to ensure that the specimen is delivered to the correct reference laboratory.

Biopsies are sent dry and kept around 4°C. It is essential that the reference laboratory receive the specimen no later than 3 hours from the time the specimen was taken.

The biopsy must be placed in sterile gauze soaked with normal sterile saline. The gauze must then be placed in a sterile universal pot and transported to the RCHT Histopathology laboratory immediately with a covering letter for the reference laboratory containing full patient details, specimen details and tests requested. The histology lab will then package the specimen to wait for collection by the arranged courier.

It is important that the histology laboratory has at least 24 hours notice to arrange correct packaging for any biopsy that is to be sent to another hospital.

9.3. **Additional Immunohistochemistry** not available at RCHT is referred to UCL. The slides are returned and interpreted by RCH histopathologists.

9.4. Her2 requests

The Her2 service is provided by the Molecular Cell Biology Unit (MCBU) to the five hospital sites within the South West Peninsular network (RCHT, Derriford, Exeter, Torbay, and Barnstaple). A 'Her2' request form must be filled in by a secretary within one of these five sites, upon request by a consultant pathologist.

The forms are available as an electronic document from the RCHT Diagnostic and Molecular Pathology Office The request form should then be sent with the appropriate paraffin wax block to the Histopathology secretaries within the RCHT site:

Diagnostic and Molecular Pathology Department
Royal Cornwall Hospital Trust
Truro Cornwall TR1 3LJ

The request form MUST contain ALL the following information:

Patient forename, surname, DOB, patient address, NHS number, patient's GP, requesting consultant.

For requests where there is a private patient, the form MUST include the name of the private insurer and the private policy number. If the patient is paying for the test to be carried out privately without insurance, then this must be specified on the Her2 request form.

10. Cytopathology Repertoire

10.1. Cervical Liquid Based Cytology (LBC) samples

10.1.1. The Cervical Screening Programme throughout the Peninsula uses Hologic (Cytyc) ThinPrep™ LBC technology.

10.1.2. All LBC sample takers must be trained in ThinPrep LBC sampling. A register of trained sample takers within the Primary Care Trusts is kept at the PCSA (Primary Care Support Agency). A similar RCHT register is kept in Colposcopy.

10.1.3. Every slide is primary screened by NHSCSP certified and state registered Biomedical Scientists or NHSCSP certified Cytoscreeners. Samples displaying abnormalities are subject to further checking by Senior Biomedical Scientists. Abnormal samples are referred and reported by Consultant Cytopathologists or Consultant Biomedical Scientist.

10.1.4. **Consumables**
Materials required for taking LBC samples are on the GPs monthly ordering lists from the contact details below. Email and Fax requests are preferred.
Hospital users may obtain materials from the Colposcopy department at Treliske. Other users should contact the laboratory.

E-mail SBS-I.SWPSS@NHS.NET<mailto:SBS-I.SWPSS@NHS.NET>
Fax 01392 351383

NHS Shared Business Services
Camberwell House
Grenadier Road
Exeter
Devon
EX1 3LQ

01392 351351

Materials provided include:

- A Vial containing PreservCytTM,
- CervexTM broom sampler (green handle)
- HMR request form.
- Specimen Bags

Please note: Vials and brushes come as a pack. Therefore brushes and vials must be ordered together in the same quantities.

Pre-printed HMR request forms are available from the Open Exeter System

10.1.5. **Prior to sampling**

- Check the patient's age. Samples not invited for screening (Under 24.5 years olds / Over 65 and ceased from screening) will be rejected if they do not have a screening history. Symptomatic patients under 24.5 years of age should be referred directly to Colposcopy.
- Label the Vial when the patient is present.
- For each Cervex sampler and Vial that Hologic provide there is also a filter and slide at the laboratory. These are ordered as a 'kit'. Please do not misuse the clinic materials as this will also waste materials at the laboratory.
- Labels with patient details may be used but keep the unlabeled portion of the Vial free of label so that the contents may be seen. If bar-coded labels are used these must be applied horizontally.
- Please note that Vials have an expiry date (YY-MM-DD). Do not use expired Vials. Remove the Vial lid before taking the sample.

10.1.6. **Taking the sample**

- **Do Not use lubricant** when inserting the speculum. Lubricant will block the filter during processing, resulting in the sample being inadequate for analysis.
- The cervix must be visualized. If you do not visualised the cervix fully then record this on the form. It is the responsibility of the smear taker to confirm they have sampled the correct area.
- Remove the mucous plug if present using a sterile swab
- The Cervex sampler is rotated 5 times clockwise. The direction is important as the bristles of the sampler are bevelled.
- Vigorously rinse the Cervex sampler into the PreservCyt fluid in the Vial by pushing it into the bottom of the Vial 10 times, forcing the bristles apart
- As a final step, swirl the Cervex vigorously to further release material. Inspect the bristles to ensure no material remains attached.
- Discard the Cervex sampler. DO NOT leave the head of the sampler in the vial.
- Use of the endocervical brush (Please note – Endocervical brushes are not supplied by the Cytopathology department)
- Evidence of Transformation Zone sampling is necessary for the follow-up of glandular abnormalities. Sampling of the Transformation Zone may be difficult in women who have had treatment for glandular abnormalities. In this circumstance it may be necessary to use an endocervical brush in addition to the Cervex broom sampler provided or refer for colposcopic assessment. If using two samplers, both samples should be rinsed into the same vial. i.e. only send one Vial per patient.

10.1.7. **Patients with two cervices**

- *These require a vial for each cervix (x2 vials). Label 1 and 2 or left and right*
- *Tighten the cap so the black torque line on the cap meets the black torque line on the Vial.*
- *All details requested on the HMR request form must be completed.*
- *Also ensure that the specimen transport bag is securely sealed before sending to the laboratory.*

10.1.8. **Interpretation of Results**

10.1.8.1. **The Screening Programme**

For an effective Programme the frequency of Cervical cancer screening must follow the National Standards[1]:

- Screening should not start until a woman is 24.5 years of age (age of first invitation). Screening under the age of 24.5 years may do more harm than good[1].
  From 25 to 49 years of age routine screening should be 3 yearly.
- From 50 to 64 years of age routine screening should be 5 yearly.
- From 65 onwards, only those who have not been screened since age 50 or those who have had recent abnormal tests should be screened.
- Colposcopy and Programme Management, NHSCSP April 2004.

10.1.8.2. For more information about the Screening Programme in Cornwall see the Cornwall and Isles of Scilly Cervical Screening Programme Policy Document, found on the Cornwall NHS net document library on the Intranet.

10.1.8.3. For details of the recommended management of patients with abnormal smears, follow-up and referral policies, contact the laboratory. (ext 2550)

10.1.9. **Time Limits for requesting additional tests**

Samples that have been rejected because the patient was not invited for screening will be retained by the laboratory for 21 days from receipt to allow the sender to make other arrangements if required (Private testing is available on request to the laboratory).

10.2. Diagnostic Cytopathology

10.2.1. For labelling of request forms and samples please refer to DDMP SPECIFIC Form & Specimen Labelling Requirements.

10.2.2. **Sample requirements**

Specimen type	Volume required	Special precautions and Factors affecting Performance/ Interpretation	Turnaround times and Time limits for additional tests.
Serous fluids Cyst fluids Hydrocele fluids	Approx 20ml in a screw top universal	DO NOT SEND LARGE VOLUMES OF FLUID (>100ml) – The department has no facilities for disposal of gross specimens	Within 7 days unless stated otherwise (eg 2WW)
Sputum	Screw top universal container	3 specimens – a deep cough specimen should be taken on each of three consecutive days. If visible food particles are present, it is advisable to repeat straight away. Better samples may be obtained in the morning, preferably before breakfast. Assistance from a physiotherapist will also produce a better sample quality for cytological analysis. Deliver the sample to the lab the same day as the sample is taken. The quality of cells suspended within sputum degrade fairly rapidly	Within 7 days unless stated otherwise (eg 2WW)
Bronchial suckings/ washings **Brushings (Liquid Based Cytology)**	20ml of fluid suspended in saline solution Cells are suspended in 20ml of Preservcyt solution (vials can be obtained from the Cytology Department	Collected at Endoscopy into universal containers – DO NO SEND THE TRAP TOPPED CONTAINERS Vigorously shake the brush end in the vial. Remove the brush from the vial with foeps and discard the brush head – DO NOT LEAVE THE BRUSH IN THE VIAL. Once the brush has been washed in Preservcyt solution DO NOT put the brush back into the patient. Complete two separate forms if both Histology (biopsies) and Cytology (suckings, washings and brushings) are requested	Within 7 days unless stated otherwise (eg 2WW) Within 7 days unless stated otherwise (eg 2WW)

Specimen type	Volume required	Special precautions and Factors affecting Performance/ Interpretation	Turnaround times and Time limits for additional tests.
Cerebrospinal fluid	Minimum 0.5ml in a sterile universal	Specimens degrade quickly and should arrive at the laboratory within 1 hour of collection. NB must arrive at the lab by 1600hrs.	Within 7 days unless stated otherwise (eg 2WW)
Fine Needle Aspirates (FNAs) ➢ **Breast** ➢ **Lymph node** ➢ **Head & neck** ➢ **Thyroid**	Air dried slides in a plastic slide carrier. Label the frosted end of each slide in pencil with two patient identifiers and FNA site. **If breast FNA, label the slides left or right as appropriate**	There are special arrangements for in-clinic diagnosis at some of the Mermaid Clinics Syringes must NOT be sent via the ATTS When smearing the cell sample, avoid pressing too hard as this will result in crush artefact. Do not make the sample too thick and air dry quickly	Mermaid Clinics - one hour from the time the sample is received in the laboratory Within 7 days unless stated otherwise (eg 2WW)
EUS/BUS FNAs	As required following sample adequacy assessment	Sample adequacy is assessed at clinic by laboratory staff (BMS) and is case dependant	Adequacy assessment is immediate at clinic. Final result within 7 days unless stated otherwise (eg 2WW)
Urine	5 – 100ml in a universal or specimen Urine Screening pot containing fixative	1st ambulatory morning sample is best (**not** EMU). If the patient has stones/ catheter/any instrumentation in place include in clinical details	Within 7 days unless stated otherwise (eg 2WW)
Joint fluids	5ml into a universal container	Analysis for the presence of gout or pseudogout crystals only Please complete a yellow Cellular Pathology form and ensure these are clearly labelled for Cytology	Within 7 days unless stated otherwise (eg 2WW)

APPENDIX 4. WEST CORNWALL HOSPITAL

1. RCH Pathology supports Point of Care testing (POCT) services at WCH hospital for the testing and management of patients where on site analysis is required. Pathology staff regularly visit to check the performance of the POCT analysers and to provide back up, stock control, training and trouble shooting services to the on site users.

2. POCT tests available at WCH:

- TnT
- D dimer
- CRP
- Blood gases
- Creatinine
- Urea
- FBC
- Glucose

3. Regular 24/7 routine transport is available to support the analysis of a full range of testing on the RCH site. There is also a transport facility for urgent analytical requirements outside of the routine transport times.

APPENDIX 5. REFERENCE FACILITIES

All departments refer some specimens for primary or secondary testing to reference facilities. This list, whilst not comprehensive, gives details of the primary facilities used.

1. CLINICAL CHEMISTRY

- Analytical Toxicology Lab, The Academic Centre, Llandough Hospital, Penarth, CF64 2XX
- Clinical Biochemistry Dept, Bristol Royal Infirmary, Marlborough Street, Bristol, BS2 8HW
- Clinical Chemistry, Medical Oncology, Ground Floor, Assay Laboratory, Charing Cross Hospital, Fulham Palace Road, London, W6 8RF
- Clinical Biochemistry Dept, City Hospital, Dudley Road, Birmingham, B18 7QH
- Combined Laboratory, Biochemistry Section, Derriford Hospital, Plymouth, Devon, PL6 8DH
- Clinical Biochemistry Department, Freeman Hospital, Freeman Road, Newcastle-Upon-Tyne, NE7 7DN
- Department of Clinical Biochemistry, Macewen Building, Glasgow Royal Infirmary, Glasgow, G4 0SF
- Chemical Pathology, Great Ormond Street Hospital for Children, Great Ormond Street, London, WC1N 3JH
- SAS Reception, Biochemical Endocrinology Hammersmith Pathology Centre, Area G, Hammersmith Hospital, London, W12 0HS
- Dept. of Neuroimmunology, Room 917, Institute of Neurology, Queen Square, London, WC1N 3BG
- Clinical Biochemistry Department, King's College Hospital, Denmark Hill , London, SE5 9RS

- Dept of Biochemistry and Immunology, Britannia House, Britannia Road, Morley, Leeds,LS27 0DQ
- Molecular Genetics Laboratory, Royal Devon & Exeter Hospital, Barrack Road, Exeter, EX2 5DW
- Dept of Chemical Pathology,Taunton & Somerset Hospital, Musgrove Park, Somerset, TA1 5DA
- Specific Protein Reference Unit, Immunology Dept., P.O. BOX 894, Sheffield, S5 7YT
- SAS peptide section, Royal Surrey County Hospital, Clinical Laboratory, Level B. Egerton Road,Guildford, GU2 7XX
- Department of Clinical Chemistry, Sheffield Children's Hospital NHS Trust, Western Bank, Sheffield, S10 2TH
- Endocrine Unit, Level D, South Pathology Block, Southampton University Hosp Trust, Tremona Road, Southampton, SO16 6YD
- Department of Clinical Chemistry, Southmead Hospital, Westbury on Trym, Bristol, BS10 5NB
- Analytical Unit, Cardiac & Vascular Sciences, St George's Hospital Medical School, Cranmer Terrace, London, SW17 0RE
- National Society for Epilepsy, Chalfont Centre for Epilepsy, Chesham Lane, Chalfont St Peter, Bucks, SL9 0RJ
- Chemical Pathology Dept., Torbay Hospital, Torquay, TQ2 7AA
- Trace Element Reference Centre, Department Clinical Biochemistry, Robens Institute, University of Surrey, Guildford, GU2 5XH
- Dept Clinical Chemistry, UCL Hospital, 60 Whitfield Street, London, W1T 4EU
- Maternal Serum Screening Laboratory, Department of Clinical Biochemistry, New Medical School, Royal Victoria Infirmary, Newcastle Upon Tyne, NE1 4LP

2. CLINICAL MICROBIOLOGY

- Public Health England, Centre for Infections, 61 Colindale Avenue, London NW9 5ht

    - Antibiotic Resistance Monitoring Laboratory
    - Laboratory of Gastrointestinal Pathogens
    - Laboratory of Hospital Associated Infection
    - Gonococcal Reference Unit
    - Haemophilus Reference Laboratory
    - Streptococcus & Diphtheria Reference Unit
    - Atypical Pneumonia Unit
    - Virus Reference Department

- Public Health England, Myrtle Road, Kingsdown, Bristol BS2 8EL

- Public Health England East of England, Clinical Microbiology, Addenbrookes Hospital, Hills Road, Cambridge, CB2 2QW

- Anaerobe Reference Unit, University Hospital of Wales, Heath Park, Cardiff CF14 4XW

- Micropathology Ltd, University of Warwick Science Park, Barclays Venture Centre, Sir William Lyons Road, Coventry, CV4 7EZ

- Microbiology, Royal Devon & Exeter Hospital (Wonford), Church Lane, Heavitree, Exeter EX2 5AD

- Microbiology, Derriford Hospital, Derriford, Plymouth PL6 8DH

- Leptospira Reference Unit, Dept. of Microbiology & Immunology, The County Hospital, Hereford HR1 2ER

- Leeds and Bradford Microbiology, Bridle Path, York Road, Leeds TS15 7TR

- Microbiology, Aintree Hospital Foundation Trust, Lower Lane, Liverpool L9 7AL

- Meningococcal Reference Unit, Manchester Medical Microbiology Partnership, 2nd & 3rd Floors

- Clinical Sciences Buildings, Central Manchester and Manchester, Children's University Hospital Trust, Manchester Royal Infirmary, Oxford Road Manchester M13 9WL

- Public Health England Special Pathogens Reference Unit, Porton Down, Salisbury, Wilts SP4 0JG

- Preston Microbiology Services, Royal Preston Hospital, PO BOX 202, Preston PR2 9HG

- Public Health England Southampton Laboratory, Level B, South Laboratory Block, Southampton General Hospital, Southampton SO16 6YD

- Microbiology Department, Singleton Hospital, Swansea, Wales SA2 8QA

- Department of Parasitology, The Hospital for Tropical Diseases, Mortimer Market, Tottenham Court Road, London WC1E 6JB

- Mycobacterium Reference Unit & Regional Centre for Mycobacteriology, Bart's and the London

- Queen Mary School of Medicine and Dentistry, Clinical Research Centre, 2 Newark Street, Whitechapel, London E1 2AT

3. DEPARTMENT OF DIAGNOSTIC AND MOLECULAR PATHOLOGY

- Roy Moate, Plymouth Electron Microscopy Centre, University of Plymouth, Drake Circus, Plymouth PL4 8AA

- Histopathology Department, Derriford Hospital, Plymouth PL6 8DH

- UCL Advanced Diagnostics, Dept of Pathology, Rm 112, 1st Floor Rockefeller Building, 21 University Street, London, WC1E 6JJ

4. DEPARTMENT OF HAEMATOLOGY

Haematology

- HPA Malaria Reference Laboratory, London School of Hygiene and Tropical Medicine, Keppel Street (Gower Street), London WC1E 7HT

Blood Transfusion

- NHS Blood and Translant – Filton, FAO Red Cell Immunohaematology, 500 North Bristol Park, Northway, Filton, Bristol BS34 7QH

Immunology

- LRF Leukaemia Unit, Dept of Haematology, Royal Postgraduate Medical School, Ducane Road, London W12 0NN
- Immunology Dept, Derriford Hospital, Plymouth PL6 8DH
- Pathology Sciences, Blood Sciences and Bristol Genetics, Southmead Hospital, Westbury on Trym, Bristol BS10 5NB
- Dept of Immunology, Southmead Hospital, Westbury on Trym, Bristol BS10 5NB
- National Amyloidosis Centre, Royal Free Hospital, Roland Hill Street, London NW3 2PF
- NBS Bristol, 500 North Bristol Park, Northrway, Filton, Bristol BS34 7QH
- HMDS, Level 3, Bexley Wing, St James' University Hospital, Leeds LS9 7TF
- Immunology Dept, Churchill Hospital, Headington, Oxford OX3 7LJ
- Neuroimmunology, Room 917, Institute of Neurology, Queens Square, London WC1N 3AR
- Neuroimmunology, Southern General Hospital, 1345 Govan Road, Glasgow GS1 4TF

- Protein Reference Unit, Dept of Immunology, PO Box 894, Sheffield S5 7YT

- Regional Molecular Genetics Unit, The Lewis Laboratories, Southmead Hospital, Bristol BS10 5NB

Coagulation

- Haemoglobinopathy section, Haematology Laboratory, Pathology Level 3, Torbay Hospital, Lawes Bridge, Torquay, TQ2 7AA.

- Oxford Haemophilia & Thrombosis Centre, Churchill hospital, Headington, Oxford, OX3 7LJ.

- Membrane Biochemistry, International Blood Group Reference Lab, NHS Blood & Transplant, 500 North Bristol Park, Northway, Filton, Bristol, BS34 7QH.

- Institute of Molecular Medicine, John Radcliffe Hospital, Headington, Oxford, OX3 9DS

- Haemostasis Research Unit, Haematology Dept, University College London, 1st Floor, 51 chennies Mews, London, WC1E 6HX

APPENDIX 6. TEST REFERENCE RANGES

CLINICAL CHEMISTRY

Please note : For all tests done in the Clinical Chemistry Laboratory, reference ranges are either from the manufacturers literature or agreed in line with the National Pathology Harmonisation project (www.pathologyharmony.co.uk).

For tests referred to other laboratories, the quoted reference ranges are those issued by that laboratory.

ANTIBIOTICS

Test	Range	Comment
Gentamicin assay	Trough 0.5 - 2.0 Peak 6.0 – 10.0	For once daily Gentamicin a lower trough is expected & peak measurement is not usually performed as is always high. Please contact Pharmacy if in doubt
Vancomycin assay	Trough 5.0 – 10.0 Peak 25.0 – 40.0	
Tobramycin assay	Trough 0.5 – 2.0 Peak 6.0 – 10.0	

These ranges only apply for multiple daily dosing.

For once daily Gentamicin a lower trough is expected and a peak measurement is not usually performed, as it is always high. Please contact the Pharmacy department if in doubt.

ADULT REFERENCE RANGES

Test Name	Age (Yrs)	Male	Female	Units
Urea and electrolytes				
Sodium		135 –145	135 – 145	mmol/L
Potassium		3.5 – 5.2	3.5 – 5.2	mmol/L
Chloride		98-107	98 -107	mmol/L
Bicarbonate		22 - 30	22 - 30	mmol/L
Creatinine		62 – 106	44 - 80	umol/L
Urea		2.8 – 7.6	2.8 – 7.6	mmol/L

Test Name	Age (Yrs)	Male	Female	Units
Liver and Bone				
ALT		<41	10 – 36	iu/L
Gamma GT		10 – 60	5 - 35	iu/L
Alkaline Phosphatase	18 -54	40 - 120	35 - 110	iu/L
	55 - 71	40 – 140	35 - 140	iu/L
	71 - 120	40 - 160	35 - 145	iu/L
Bilirubin		<17	<17	umol/L
Conjugated Bilirubin		<5	<5	umol/L
Total protein		60 – 83	60 – 83	g/L
Albumin		35 – 50	35 – 50	g/L
Corrected calcium		2.10 – 2.55	2.10 – 2.55	mmol/L
Phosphate		0.8 – 1.45	0.8 – 1.45	mmol/L
Magnesium		0.7 – 1.0	0.7 – 1.0	mmol/L
Urate		0.14 – 0.34	0.14 – 0.34	mmol/L
Glucose (fasting)		3.0 – 6.0	3.0 – 6.0	mmol/L
Ammonia		<44	<44	umol/L
Lactate		0.5 – 2.2	0.5 – 2.2	mmol/L
Other enzymes				
Creatine Kinase		24 – 195	24 – 170	iu/L
Amylase		28 – 100	28 - 100	iu/L
LDH		135 – 225	135 - 214	iu/L
Lipids				
Total cholesterol		3.5 – 5.2	3.5 – 5.2	mmol/L
HDL		0.8 – 1.7	0.9 – 2.1	mmol/L
LDL		1.4 – 4.0	1.4 – 4.0	mmol/L
Triglyceride		0.5 – 1.86	0.5 – 1.86	mmol/L
Proteins				
Alpha-1-antitrypsin		1.1 – 2.1	1.1 – 2.1	g/L

Test Name	Age (Yrs)	Male	Female	Units
Beta-2-microglobulin		<2.2	<2.2	mg/L
Caeruloplasmin		0.16 – 0.36	0.18 – 0.53	g/L
CRP		<5	<5	mg/L
Haptoglobin		0.3 – 2.0	0.3 – 2.0	g/L
Immunoglobulin G		6.0 – 16.0	6.0 – 16.0	g/L
Immunoglobulin A		0.8 – 4.0	0.8 – 4.0	g/L
Immunoglobulin M		0.2 – 2.0	0.2 – 2.0	g/L
Iron studies and haematinics				
Iron		9.5 – 30	8.8 - 27	umol/L
Transferrin		2.0 – 3.2	2.0 – 3.2	g/L
Ferritin		40 - 300	13 - 150	ug/L
Vitamin B12		197 – 866	197 - 866	ng/L
Folate		4.6 – 18.7	4.6 – 18.7	ug/L
Hormones				
Cortisol	Time 09:00	170 – 700	170 – 700	nmol/L
DHEAS Dehydroepiandrosterone sulphate	14 – 19 20 – 24 25 – 34 35 – 44 45 – 54 55 – 64 65 – 74 75 - 120	1.91 – 13.4 5.73 – 13.4 4.34 – 12.2 2.41 – 11.6 1.20 – 8.98 1.4 – 8.01 0.91 – 6.76 0.44 – 3.34	1.77 – 9.99 4.02 – 11.0 2.69 – 9.23 1.65 – 9.15 0.96 – 6.95 0.51 – 5.56 0.26 – 6.68 0.33 – 4.18	umol/L
FSH		1.5 0 12.4	Follicular 3.5 – 12.5 Ovulation 4.7 – 21.5 Luteal 1.7 – 7.7	IU/L
LH		1.7 – 8.6	Follicular 2.4 – 12.6 Ovulation 14.0 – 95.6 Luteal 1.0 – 11.4	IU/L
Insulin-like growth factor (ILGF-1)	16 – 20 21- 40 41 – 60 61 - 120	23 - 70 13 – 50 9 – 40 6 - 36	23 - 70 13 – 50 9 – 40 6 - 36	nmol/L
PTH		1.6 – 6.9	1.6 – 6.9	pmol/L

Test Name	Age (Yrs)	Male	Female	Units
Prolactin		86 – 324	102 – 496	mU/L
SHBG		18 – 55	40 – 120	nmol/L
Testosterone		8.7 – 29.0	0.2 – 1.7	nmol/L
TSH		0.35 – 4.5	0.35 – 4.5	miu/L
Free T4		11 – 24	11 – 24	pmol/L
Free T3		4.0 – 6.8	4.0 – 6.8	pmol/L
Thyroid Peroxidase Antibodies		<34	<34	IU/L
Tumour markers				
AFP		<10	<10	U/L
HCG		<5	<5	U/mL
CEA		<3.5	<3.5	ug/L
CA125			<35	U/mL
CA 19-9		<35	<35	ug/L
PSA	Upto 60y	<4		ug/L
	61 - 70	5		ug/L
	71 – 120	<6.		ug/L
Vitamins				
Vitamin A	<4yr 4-18 yrs Adult male Adult female	0.5-1.6 0.8-2.2 1.1-3.4	0.8-3.0	umol/L
Vitamin E		10.2 - 39	10.2 - 39	umol/L
Vitamin D		<25 Severe vitamin D deficiency 25 – 50 vitamin D insufficiency 50 – 75 Adequate vitamin D >75 Optimal vitamin D >300 May indicate toxicity		nmol/L
Urine				
Electrolytes (24h)				
Sodium		40 - 200	40 - 200	mmol/24h
Potassium		25 - 125	25 - 125	mmol/24h
Urea		330 - 580	330 - 580	mmol/24h
Creatinine		9 - 17	9 - 17	mmol/24h

Test Name	Age (Yrs)	Male	Female	Units
Catecholamines (overnight)				
Noradrenaline		<48	<48	nmol/mmol Creat
Adrenaline		<10	<10	nmol/mmol Creat
Dopamine		<300	<300	nmol/mmol Creat
5-HIAA (24h) (5 Hydroxy Indole Acetic acid)		9 – 45	9 - 45	umol/24h
Urine Free Cortisol (24h)		100 - 300	100 - 300	nmol/24h

PAEDIATRIC (<16 YEARS) REFERENCE RANGES:

Test Name	Age (yrs)	Male	Female	Units
Urea and electrolytes				
Creatinine	**1**	15 - 37	15 - 37	**umol/L**
	3	21 – 36	21 – 36	
	5	27 – 42	27 – 42	
	7	28 – 52	28 – 52	
	9	35 – 53	35 – 53	
	11	34 – 65	34 – 65	
	13	46 – 70	46 – 70	
	15	50 – 77	50 – 77	
Creatinine (enzymatic)	**1**	15 – 37	15 - 37	**umol/L**
	3	21 – 36	21 – 36	
	5	27 – 42	27 – 42	
	7	28 – 52	28 – 52	
	9	35 – 53	35 – 53	
	11	34 – 65	34 – 65	
	13	46 – 70	46 – 70	
	15	50 – 77	50 – 77	
Urea	**3**	1.0 - 4.4	-	**mmol/L**
	6	-	1.2 - 5.0	
	9	1.2 - 5.7	-	
	15	1.8 - 6.3	-	
	18	1.8 - 7.1	1.4 - 5.5	

Test Name	Age (yrs)	Male	Female	Units
Liver and Bone				
Alkaline Phosphatase	**1**	80 - 450	100 - 460	**iu/L**
	12	50 – 300	70 – 300	
	15	50 – 390	50 – 160	
	18	60 – 170	50 – 120	
Total protein	**1m**	45 - 65	45 – 65	**g/L**
	1	50 – 75	50 – 75	
Corrected calcium	**1m**	2.40 - 2.77	2.40 - 2.77	**mmol/L**
	4m	2.38 - 2.74	2.38 - 2.74	
	7m	2.35 - 2.71	2.35 - 2.71	
	10m	2.32 - 2.68	2.32 - 2.68	
	2	2.30 - 2.67	2.30 - 2.67	
	3	2.30 - 2.64	2.30 - 2.64	
	4	2.26 - 2.62	2.26 - 2.62	
	5	2.23 - 2.60	2.23 - 2.60	
	6	2.22 - 2.58	2.22 - 2.58	
	7	2.21 - 2.58	2.21 - 2.58	
	8	2.20 - 2.57	2.20 - 2.57	
	9	2.22 - 2.58	2.22 - 2.58	
	11	2.22 - 2.57	2.22 - 2.57	
Ionised Calcium	**1d**	1.08 - 1.42	1.08 - 1.42	**mmol/L**
	2d	1.11 - 1.39	1.11 - 1.39	
	3d	1.18 - 1.42	1.18 - 1.42	
	4d	1.10 - 1.42	1.10 - 1.42	
	5d	1.14 - 1.46	1.14 - 1.46	
	6d	1.18 - 1.46	1.18 - 1.46	
	7d	1.18 - 1.46	1.18 - 1.46	
	11m	1.23 - 1.37	1.23 - 1.37	
	5	1.20 - 1.34	1.20 - 1.34	
Phosphate	**1**	1.30 - 2.22	1.30 - 2.22	**mmol/L**
	3	1.00 - 1.90	1.00 - 1.90	
	12	1.00 - 1.80	1.00 - 1.80	
	18	0.90 - 1.60	0.90 - 1.60	
Urate	**1m**	0.06 - 0.27	-	**mmol/L**
	12	0.12 - 0.33	-	
	18	0.16 - 0.43	0.13 - 0.38	
Lipids				
Total cholesterol	**10**	3.4 - 4.8	3.4 - 4.8	**mmol/L**

Test Name	Age (yrs)	Male	Female	Units
	15	3.4 - 4.9	3.4 - 4.9	
HDL	**6**	0.8 - 1.8	0.8 - 1.8	**mmol/L**
	10	1.0 - 1.8	1.0 - 1.8	
	15	1.0 – 1.8	1.0 - 1.8	
LDL	**6**	1.57 - 3.0	1.57 - 3.0	**mmol/L**
	10	1.7 - 3.0	1.7 - 3.0	
	15	1.8 - 3.0	1.8 - 3.0	
Triglyceride	**10**	0.41 - 1.25	0.41 - 1.25	**mmol/L**
	15	0.45 - 1.36	0.45 - 1.36	
Proteins				
Alpha-1-antitrypsin	**7m**	0.8 - 1.8	0.8 - 1.8	**g/L**
	2	1.1 - 2.0	1.1 - 2.0	
	6	1.1 - 2.2	1.1 - 2.2	
	11	1.4 - 2.3	1.4 - 2.3	
	16	1.2 - 2.0	1.2 - 2.0	
Caeruloplasmin	**4m**	0.09 - 0.27	0.09 - 0.27	**g/L**
	1	0.14 - 0.41	0.14 - 0.41	
	10	0.14 - 0.47	0.14 - 0.47	
	13	0.16 - 0.27	0.16 - 0.27	
Immunoglobulin G	**2w**	5.0 - 17.0	5.0 - 17.0	**g/L**
	6w	3.9 - 13.0	3.9 - 13.0	
	3m	2.1 - 7.7	2.1 - 7.7	
	6m	2.4 - 8.8	2.4 - 8.8	
	9m	3.0 - 9.0	3.0 - 9.0	
	12m	3.0 - 10.9	3.0 - 10.9	
	2	3.1 - 13.8	3.1 - 13.8	
	3	3.7 - 15.8	3.7 - 15.8	
	6	4.9 - 16.1	4.9 - 16.1	
	9	5.4 - 16.1	5.4 - 16.1	
	12	5.4 - 16.1	5.4 - 16.1	
	15	5.4 - 16.1	5.4 - 16.1	
Immunoglobulin A	**2w**	0.01 - 0.08	0.01 - 0.08	**g/L**
	6w	0.02 - 0.15	0.02 - 0.15	
	3m	0.05 - 0.4	0.05 - 0.4	
	6m	0.1 - 0.5	0.1 - 0.5	
	9m	0.15 - 0.7	0.15 - 0.7	
	12m	0.2 - 0.7	0.2 - 0.7	
	2	0.3 - 1.2	0.3 - 1.2	
	3	0.3 - 1.3	0.3 - 1.3	

Test Name	Age (yrs)	Male	Female	Units
	6	0.4 - 2.0	0.4 - 2.0	
	9	0.5 - 2.4	0.5 - 2.4	
	12	0.7 - 2.5	0.7 - 2.5	
	15	0.8 - 2.8	0.8 - 2.8	
Immunoglobulin M	**2w**	0.05 - 0.20	0.05 - 0.20	**g/L**
	6w	0.08 - 0.40	0.08 - 0.40	
	3m	0.15 - 0.70	0.15 - 0.70	
	6m	0.2 - 1.0	0.2 - 1.0	
	9m	0.4 - 1.6	0.4 - 1.6	
	12m	0.6 - 2.1	0.6 - 2.1	
	2	0.5 - 2.2	0.5 - 2.2	
	3	0.5 - 2.2	0.5 - 2.2	
	6	0.5 - 2.0	0.5 - 2.0	
	9	0.5 - 1.8	0.5 - 1.8	
	12	0.5 - 1.8	0.5 - 1.8	
	15	0.5 - 1.9	0.5 - 1.9	
Hormones				
DHEAS (Dehydroepiandrosterone Sulphate)	**1w**	2.93 - 16.5	2.93 - 16.5	**umol/L**
	4w	0.86 - 11.7	0.86 - 11.7	
	1	0.09 - 3.35	0.09 - 3.35	
	4	0.01 - 0.53	0.01 - 0.53	
	10	0.08 - 2.31	0.08 - 2.31	
	14	0.66 - 6.70	0.92 - 7.60	
Insulin-like growth factor 1 (ILGF-1)	**6**	4 - 20	4 - 20	**nmol/L**
	9	7 – 40	7 – 40	
	10	12 – 50	12 – 50	
	11	17 – 60	17 – 60	
	12	20 – 85	20 – 85	
	13	23 – 90	23 – 90	
	16	30 – 90	30 – 90	
Iron Studies				
Iron	**5m**	3.5 - 15	3.5 - 15	**umol/L**
	2	5.5 – 20	5.5 – 20	
	6	6.5 – 23	6.5 – 23	
Vitamins				
Vitamin A	**<4 yrs**	0.5 - 1.6	0.5 - 1.6	**umol/L**

Test Name	Age (yrs)	Male	Female	Units
	4-18 yrs	0.8 - 2.2	0.8 - 2.2	
	Adult	1.1-3.4	0.8-3.0	

HAEMATOLOGY

TEST NAME	AGE (years unless stated)	MALE	FEMALE	UNITS
ESR	<25 25-34 35-44 45-54 55-64 65-67 68-71 >72	2-6 2-9 2-10 2-13 2-20 2-25 2-30 2-50	2-16 2-15 2-15 2-20 2-25 2-27 2-30 2-36	mm/hr
Reticulocytes	Up to 3 days 3 – 7 days >1 week	100-450 10-150 25-125	100-450 10-150 25-125	$x10^9$/l
Haemoglobin	Up to 1 day 1 day – 1 week 1 -2 weeks 2 – 4 weeks 1 - 2 months 2 - 6 months 6 months – 2 years 2 - 6 years 6 – 12 years 12 – 18 years > 18 years	137-201 142-240 128-218 101-183 90-140 89-141 97-151 96-148 107-154 115-170 133-167	137-201 142-240 128-218 101-183 90-140 89-141 97-151 96-148 107-154 117-154 118-148	g/l
RBC count	Up to 1 day 1 day – 1 month 1 month – 1 year 1 – 10 years > 10 years	3.5-6.7 2.8-6.5 2.6-5.5 4.1-5.3 4.3-5.7	3.5-6.7 2.8-6.5 2.6-5.5 4.1-5.3 3.9-5.0	$x10^{12}$/l
Haematocrit	Up to 1 day 1 day – 3 months 3 months – 6 years 6 – 12 years > 12 years	0.47-0.59 0.26-0.7 0.27-0.44 0.34-0.42 0.39-0.50	0.47-0.59 0.26-0.7 0.27-0.44 0.34-0.42 0.36-0.44	l/l
Mean cell volume	Up to 1 day	90-118	90-118	fl

TEST NAME	AGE (years unless stated)	MALE	FEMALE	UNITS
	1 day – 3 months 3 months – 1 year 1 – 6 years 6 – 12 years > 12 years	75-125 68-103 71-86 75-91 77-98	75-125 68-103 71-86 75-91 77-98	
Mean cell Haemoglobin	Up to 3 months 3 months – 6 years 6 – 12 years > 12 years	26.0-40.0 23.0-35.0 25.0-33.0 27.3-32.6	26.0-40.0 23.0-35.0 25.0-33.0 27.3-32.6	pg
Mean cell Haemoglobin Concentration	All	316-349	316-349	g/l
WBC count	Up to 8 days 8 days – 1 year 1 – 3 years 3 – 6 years 6 – 8 years 8 – 16 years > 16 years	5.0-23.0 5.0-19.5 5.6-17.0 4.9-12.9 4.4-10.6 3.9-9.9 3.7-9.5	5.0-23.0 5.0-19.5 5.6-17.0 4.9-12.9 4.4-10.6 3.9-9.9 3.9-11.1	$x10^9/l$
Neutrophil count	Up to 1 day 1 – 3 days 3 days – 1 year 1 – 6 years 6 – 16 years > 16 years	1.7-23.0 3.8-17.1 1.3-9.4 1.5-7.7 1.4-5.9 1.7-7.5	1.7-23.0 3.8-17.1 1.3-9.4 1.5-7.7 1.4-5.9 1.7-7.5	$x10^9/l$
Lymphocyte count	Up to 1 day 1 – 3 days 3 days – 1 year 1 – 6 years 6 – 16 years > 16 years	1.0-11.0 2.0-7.3 1.9-13.5 1.6-8.6 1.4-4.3 1.0-3.2	1.0-11.0 2.0-7.3 1.9-13.5 1.6-8.6 1.4-4.3 1.0-3.2	$x10^9/l$
Monocyte count	Up to 1 day 1 – 3 days 3 days – 1 year 1 – 16 years > 16 years All	0.1-3.7 0.1-1.9 0.1-1.8 0.1-1.3 0.2-0.6	0.1-3.7 0.1-1.9 0.1-1.8 0.1-1.3 0.2-0.6	$x10^9/l$
Eosinophil count	Up to 1 day 1 – 3 days	0.1-2.0 0.1-0.8	0.1-2.0 0.1-0.8	$x10^9/l$

TEST NAME	AGE (years unless stated)	MALE	FEMALE	UNITS
	3 days – 1 year 1 – 6 years 6 – 16 years > 16 years	0.1-0.9 0.1-1.4 0.1-1.0 0.1-0.5	0.1-0.9 0.1-1.4 0.1-1.0 0.1-0.5	
Basophil count	Up to 1 year > 1 year	0.02-0.2 0.02-0.1	0.02-0.2 0.02-0.1	$x10^9/l$
Platelet count	All	150-400	150-400	$x10^9/l$
Plasma viscosity	All	1.5-1.72	1.5-1.72	cp

COAGULATION (HAEMATOLOGY)

Test	Range	Comment
INR for warfarin	**2.0 – 2.5** **2.0 – 3.0** **3.0 – 4.5**	According to clinical indication (see BNF). Prophylaxis of DVT Hip and Femur Surgery Treatment of DVT, PE, Atrial Fibrillation & TIA, Antiphospholipid syndrome, Arterial grafts & Arterial Disease including MI. Recurrent DVT & PE (in patients currently receiving warfarin with INR> 2) Artificial heart valves Antithrombin, Protein C & S Deficiencies - refer to Consultant Haematologist.
APTT for heparin	**1.5 - 2.5**	According to clinical indication.

Neonatal & adult reference ranges for Coagulation screening

Test	Preterm		Term	1 month	3 months	Adult
	19-30 weeks	**30-38 weeks**				
INR	1.7-5.0	0.8-1.8	0.9-1.5	0.7-1.3*	0.7-1.2*	0.8-1.2
APTT ratio	2.5-5.0	0.9-2.0	0.9-1.6	0.8-1.5*	0.8-1.3*	0.8-1.2
TCT ratio	1.7-3.1	0.8-1.7	0.8-1.5	0.8-1.2*	0.8-1.2*	0.8-1.2
Fibrinogen	0.6-3.0	1.3-3.5	0.6-3.8	1.5-3.8*	1.5-3.8*	1.5-4.0

Male Fertility Testing Ranges

Parameter	Normal Ranges
Sample Age	**0-2 hrs**
pH	**7.2-8.1**
Volume	**1.5 - 10ml**
Motility	**40-100%**
Normal sperm	**>4%**
Abnormal sperm	**<96%**
MAR (Antibody screen)	**negative**
Count	**>15 million per ml**
Film	**see comments**
Viability	**>58%**

CLINICAL MICROBIOLOGY

Normal CSF values

Leucocytes	Neonates (< 4 weeks old)	0-30 cells x 10^6/l
	4 weeks -4yr old	0-20 cells x 10^6/l
	5yr-puberty	0-10 cells x 10^6/l
	Adults	0-5 cells x 10^6/l
Erythrocytes	Newborn	0-675 cells x 10^6/l
	Adults	0-10 cells x 10^6/l

APPENDIX 7. VACUTAINER TUBE GUIDE

BD Vacutainer®

BD Diagnostics - Preanalytical Systems

Royal Cornwall NHS Trust

April 2012 version

Blood samples should be taken in the following order:

Cap Colour	Volume	Tube Contents	Tests	Special Instructions
		Blood Culture	Aerobic followed by anaerobic - if insufficient blood for both culture bottles, use aerobic bottle only.	
	Cat. No. 363095/KFK119 Draw Volume 2.7ml	Sodium Citrate	INR, APTT, Coagulation Screens (Factor Assay and Thrombophilla Screen by arrangement only ext. 2502 three tubes are required.)	**Must be first tube taken after blood cultures.** Fill to the line and mix well. APTT & Coag screen must be tested on the same day. Paediatric 1ml size from lab. Min 3-4 Times
	Cat. No. 367954/KFK114 Draw Volume 5.0ml	SST™ II	Routine Chemistry and Immunology. Routine Clinical Microbiology. Ante-natal infection screen PCR assays for Hepatitis B and C.	Request form gives advice on the need for additional tubes. Min 8-10 Times
	Cat. No. 367885/KFK173 Draw Volume 6.0ml	Heparin	Alternative for Electrolytes, if advised by laboratory. Contact lab first if special tests are required.	Min 8-10 Times
	Cat. No. 367839/KFK171 Draw Volume 4.0ml	EDTA	Full Blood Count, Film, Reticulocytes, Haemoglobin electrophoresis, Sickle test, IM screen, Malarial parasites. Haemoglobin A1c, Lead, Porphyrin. PCR assays, ESR.	Mix Well. Paediatric size available from lab 2500. Min 8-10 Times
	Cat. No. 367941/KFK277 Draw Volume 6.0ml	Cross Match	BLOOD TRANSFUSION LAB ONLY:- Crossmatch, Group and Save, Ante-natal group and screen, DAT, Kleihauer. Also used for Paediatric Samples.	Labels MUST be handwritten, forename, surname, unique number (NHS or CR) DoB, gender. Signed, dated & timed by taker. Min 8-10 Times
	Cat. No. 368201/KFK374 Draw Volume 5.0ml	Fluoride Oxalate	Glucose, Alcohol, other tests on advice from Lab.	Mixing essential for preservation. Not required for in-patients at RCH if received within 3 hours of collection. Min 8-10 Times
	Cat. No. 368381/KFK360 Draw Volume 6.0ml	Trace Element	Trace elements.	Please contact lab for advice regarding use. Min 8-10 Times

IMPORTANT MIXING GUIDELINES

Min 8-10 Times

All BD Vacutainer® tubes require immediate mixing following collection. Insufficient mixing can result in inaccurate test results and the need to re-draw. Correct mixing technique is to invert each tube by the recommended number of times shown on the right hand side of the table.

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BD

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Appendix 8. Governance Information

Document Title	Pathology User Guide			
Date Issued/Approved:	January 2015			
Date Valid From:	January 2015			
Date Valid To:	January 2018			
Directorate / Department responsible (author/owner):	Laboratory Medicine & Dept of Diagnostic and Molecular Pathology. Sarah Pointon, Pathology Quality and Improvement Manager			
Contact details:	01872 252549 Email sarah.pointon@rcht.corwall.nhs.uk			
Brief summary of contents	Guidance to users on contacting Pathology staff, information on specimen types, specimen containers and tests available with turnaround times. Reference ranges and more detailed information on the services offered.			
Suggested Keywords:	Pathology, tests, specimen collection, biochemistry, microbiology, haematology, blood transfusion, histology, cytology.			
Target Audience	RCHT	PCH	CFT	KCCG
	✓			
Executive Director responsible for Policy:	Medical Director			
Date revised:	01/11/2014			
This document replaces (exact title of previous version):	Pathology User Guide V9.0			
Approval route (names of committees)/consultation:	Pathology Departmental Leads CSSC Governance DMB			
Divisional Manager confirming approval processes	Sally Rowe, Divisional Director CSSC			
Name and Post Title of additional signatories	Janet Gardner, Governance Lead CSSC			
Signature of Executive Director giving approval	{Original Copy Signed}			
Publication Location (refer to Policy on Policies – Approvals and Ratification):	Internet & Intranet	✓	Intranet Only	
Document Library Folder/Sub Folder	Clinical / Pathology			

Links to key external standards	Clinical Pathology Accreditation (UK) Ltd; Standards for the Medical Laboratory: Standard E1 Information for users and patients
Related Documents:	Pathology Specimen Acceptance Policy Guidelines on Blood Culture Collection
Training Need Identified?	No

Version Control Table

Date	Version No	Summary of Changes	Changes Made by *(Name and Job Title)*
	V6.0	Previous changes not known	
19 Sep 11	V7.0	Transferred to Trust template for Corporate Documents Changes to contact details, Addition of	K J Pollard Lab Administrator CMB
17/01/13	V8.0	Minor changes/updates. Contact details, Test/Specimen guide. Changes to departmental specific sections	K J Pollard Lab Administrator CMB
15/04/14	V9.0	Minor changes/updates. Contact details, Test/Specimen guide. Changes to departmental specific sections Ditto	K J Pollard Lab Administrator CMB
1/11/14	V10.0	Minor changes/updates. Contact details, Test/Specimen guide. Changes to departmental specific sections	S Pointon Pathology Quality and Improvement

All or part of this document can be released under the Freedom of Information Act 2000

This document is to be retained for 10 years from the date of expiry.

This document is only valid on the day of printing

Controlled Document

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Appendix 9. Initial Equality Impact Assessment Form

Name of the strategy / policy /proposal / service function to be assessed (hereafter referred to as *policy*) (Provide brief description): **Pathology User Guide**	
Directorate and service area: CSSC, Pathology	Is this a new or existing Policy? Existing
Name of individual completing assessment: Sarah Pointon	Telephone: 01872 252549
1. Policy Aim* Who is the strategy / policy / proposal / service function aimed at?	To provide guidance on Pathology Laboratory Services
2. Policy Objectives*	To advise service users of who to contact within Pathology with enquiries and to provide contact details To advise users of services/tests provided To advise users of specimen acceptance criteria To provide basic guidance no result interpretation
3. Policy – intended Outcomes*	Effective use of and understanding services provided by Pathology services to Healthcare staff in Cornwall
4. *How will you measure the outcome?	Feedback from users via User Questionnaires, Maintenance of the quality and appropriateness of specimen received.
5. Who is intended to benefit from the policy?	Health care staff within Cornwall employed by RCHT, Cornwall Foundation Trust and Cornwall & IoS Primary Care Trust
6a) Is consultation required with the workforce, equality groups, local interest groups etc. around this policy? b) If yes, have these *groups been consulted? C). Please list any groups who have been consulted about this procedure.	No

7. The Impact Please complete the following table.			
Are there concerns that the policy **could** have differential impact on:			
Equality Strands:	Yes	No	Rationale for Assessment / Existing Evidence
Age		√	

Sex (male, female, trans-gender / gender reassignment)		√	
Race / Ethnic communities /groups	√		This may have an impact on employees who do not speak good English, however, staff employed in healthcare roles in which they would need to consult the handbook, would be required to have a reasonable level of English. Contact details are given at the beginning of the handbook should problems arise.
Disability - Learning disability, physical disability, sensory impairment and mental health problems	√		There is a potential for impact upon partially sighted/blind individuals working within healthcare. It is likely that provision will have been made by the departmental/practice managers to adapt working conditions, but in the event that this is not the case, contact details are given within the handbook to enable managers to contact the departments to ask for direct advice by telephone for the employee or to arrange to have a hard copy of the handbook produced in Braille.
Religion / other beliefs		√	
Marriage and civil partnership		√	
Pregnancy and maternity		√	
Sexual Orientation, Bisexual, Gay, heterosexual, Lesbian		√	

You will need to continue to a full Equality Impact Assessment if the following have been highlighted:

- You have ticked "Yes" in any column above and
- No consultation or evidence of there being consultation- this excludes any *policies* which have been identified as not requiring consultation**. or**
- Major service redesign or development

8. Please indicate if a full equality analysis is recommended.	~~**Yes**~~	**No**

9. If you are not recommending a Full Impact assessment please explain why.

Signature of policy developer / lead manager / director	Date of completion and submission

Names and signatures of members carrying out the Screening Assessment	1. Sarah Pointon 2.	

Keep one copy and send a copy to the Human Rights, Equality and Inclusion Lead, c/o Royal Cornwall Hospitals NHS Trust, Human Resources Department, Knowledge Spa, Truro, Cornwall, TR1 3HD

A summary of the results will be published on the Trust's web site.

Signed _____

Date _____